

Memorandum

To: Sean Sheldrake, U.S. EPA Region 10

From: Lance Peterson, RG and Stephen Dent, PhD

Date: June 25, 2013

Subject: Arkema Offshore NAPL Evaluation

This memorandum presents CDM Smith Inc.'s (CDM Smith) evaluation of the presence of non-aqueous phase liquid (NAPL) offshore of the Arkema Inc. facility in Portland, Oregon. This evaluation was conducted as a response to Legacy Site Services' (LSS) statement that, "There is no documented presence of NAPL in sediments off the Arkema site." This statement was made by LSS as part of their March 28, 2013 response to the U.S. Environmental Protection Agency's (EPA) February 11, 2013 comments on the draft *Engineering Evaluation and Cost Analysis* (EE/CA)(Integral Consulting Inc., 2012) for the Arkema Early Action site. Specifically, LSS made this statement in response to EPA's EE/CA Comment No. 40 in which the EPA indicated that source material (i.e., NAPL) is present offshore of the Arkema site.

Methodology

In order to evaluate the presence of NAPL offshore of the Arkema site, CDM Smith considered several lines of evidence. The primary and strongest line of evidence used was visual observations of blebs, globules, dark brown oily material, or other similar terms as documented on existing sediment core logs. Secondary lines of evidence were also evaluated to determine if the data suggested the presence of NAPL. The secondary lines of evidence were evaluated to support the core log evaluation findings or provide information on the potential presence of NAPL where visual observations were lacking. The secondary lines of evidence evaluated included:

- Evaluating sheen and odor along with corresponding elevated organic vapor meter (OVM) measurements
- Screening of transition zone water (TZW) and in-river groundwater concentration data
- Evaluation of upland NAPL plumes with respect to proximity to the Willamette River

The following sections discuss evaluation of the primary and secondary lines of evidence and the findings with regard to the presence of NAPL offshore of the Arkema site.

Evaluation of Sediment Core Logs

CDM Smith evaluated 73 sediment core logs obtained from the reports listed below:

- Phase II Stage 1 & 2 In-River Groundwater/Sediment Investigation Report (Integral Consulting Inc., 2003) - 25 Logs
- Portland Harbor RI/FS Round 2A Sediment Site Characterization Summary Reports and the Round 2B Field Summary Report (Lower Willamette Group, 2005) - 12 Sediment Core Logs Adjacent to the Arkema Facility
- Final Removal Action Area Characterization Report (Integral Consulting Inc., 2011) 36
 Logs

The sediment core logs were reviewed to determine if terms such as blebs, globules, dark brown oily material, etc., were documented indicating the likely presence of NAPL. Out of 73 sediment core logs reviewed, six cores were identified as containing terms indicating the presence of NAPL. These six sediment cores are:

The sediment core log noted that a "residual NAPL" was observed from 11.8 to 11.9 feet below mudline (ft bml). Note that there was no sample recovery from 11.9 to 15.9 ft bml as the sediment was very soft so NAPL presence could not be verified for this interval but a strong odor was noted at 15.9 ft bml at the top of the next sample recovered.

In addition, the report text (Integral Consulting Inc., 2003) noted a positive response to the Sudan IV field screening for NAPL at -12.5 to -14.4 ft City of Portland Datum (CPD) although the report notes that this may have been due to petroleum hydrocarbons based on visual evidence.

The report further indicates a residual NAPL of unknown origin was identified at -22.4 to -24.4 ft CPD and visual evidence of residual NAPL characteristic of DDT manufacturing (identified in text specifically as NAPL) was observed as a 0.1-foot band corresponding with a spike in an OVM measurement.

- WB-11 "Trace of dark brown oily material" noted at 6.5 to 7.5 ft bml.
 "Strong odor" accompanied by a "few black bands 1" thick" were noted from 13.5 to 14.5 ft bml.
- "Small brown oil globules" noted from 8 to 9.3 ft bml. "Small brown oil globules" noted from 10 to 10.8 ft bml. "Few oil globules" noted from 13.2 to 13.3 ft bml. "Heavy sheen with oil globules" noted from 18 to 19 ft bml.
- □ WB-36 "SAND with black oily material" and "strong chemical/decaying vegetation odor" noted from 9.5 to 10 ft bml.

WB-49 "A few small spotty brown oil globules" noted from 3 to 4 ft bml.

"Black liquid with oily odor" noted from 54 to 56 centimeters bml (1.77 to 1.83 ft bml).

Copies of the logs where the likely presence of NAPL has been identified are provided in **Attachment A**. The intervals where terms indicating the presence of NAPL were identified have been highlighted on each log for review. **Figure 1** shows the six sediment core locations where NAPL has been potentially identified based on a review of the sediment core logs.

In addition, CDM Smith provided oversight of field investigation activities that occurred in 2009 (CDM Federal Programs Corporation, 2010). The CDM Smith representative noted oil globules and heavy sheen in sediment core WB-35 from 8 to 10 ft bml, 12 to 14 ft bml, and 18 to 20 ft bml along with moderate to strong petroleum odors. Two photographs (No. 007 and No. 008) were taken of the core showing the oil globules.

Secondary Lines of Evidence

Sheen and Odors with Corresponding Elevated OVM Measurements

Sheens and odors along with corresponding elevated OVM readings provide further evidence of the presence of NAPL. *DNAPL Site Evaluation* (Cohen & Mercer, 1993), a dense NAPL (DNAPL) site evaluation guidance document, identifies a range of OVM readings from 100 to 1,000 parts per million (ppm) as potentially indicating the presence of NAPL. **Table 1** provides a summary of the sediment cores in which sheen, odor, and elevated OVM readings were observed.

Sheen covered sediment accompanied with odor, and elevated OVM readings were observed at core locations WB-6, WB-11, WB-36, WB-39, WB-42, C348, C351, C360-2 and C366-2. **Table 1** presents the OVM readings obtained at each core location. The highest OVM reading of 3,000 ppm was obtained at core location WB-6 where residual NAPL was also observed. OVM readings greater than 1,000 ppm, along with sheen and odor, were observed at sediment core locations WB-10, WB-11, and C351, providing strong evidence of the presence of NAPL. **Figure 1** shows the locations where sheen/odors and accompanied elevated OVM readings indicate the potential presence of NAPL through this secondary line of evidence. **Attachment B** provides the sediment core logs for these locations.

TZW and In-River Groundwater Concentrations Screening

TZW and in-river groundwater concentration data was screened based on criteria presented in the *DNAPL Site Evaluation* (Cohen & Mercer, 1993) guidance document, which indicates that contaminant concentrations exceeding 1% solubility may infer the presence of NAPL. For this evaluation, two contaminants of concern were assessed: 4,4'-DDT and chlorobenzene. The 1% solubility criteria for 4,4'-DDT is 0.0325 micrograms per liter (μ g/L), and the 1% solubility criteria for chlorobenzene is 5,000 μ g/L.

TZW samples were collected as part of the Portland Harbor Remedial Investigation (RI) in an area along the shore just to the north of Dock 2 (downstream dock) and adjacent to the NAPL plume identified in the Arkema Upland RI Report (Environmental Resources Management, 2005), which is approximated to border the river's edge. Sample locations where concentrations exceeded the 1% solubility criteria for 4,4'-DDT and/or chlorobenzene are shown on **Table 2**. The contaminants 4,4'-DDT and/or chlorobenzene were detected in TZW samples at concentrations ranging from 0.84 to 2.7 μ g/L and 12,000 to 30,000 μ g/L, respectively. **Figure 1** shows the locations where elevated contaminant concentrations in TZW samples indicate the potential presence of NAPL through this secondary line of evidence.

Groundwater samples collected offshore of the Arkema site were collected during Phase II, Stage 1, of the Groundwater and Sediment Investigation performed by Integral Consulting Inc. in 2002 and 2003 for ATOFINA Chemicals. **Table 3** lists groundwater sample locations where 4,4'-DDT and/or chlorobenzene analytical results exceeded the 1% solubility criteria. Note that all positive results for 4,4'-DDT above the detection limit are listed as the detection limit did not drop below the 1% saturation criteria. Note also that all but three of the reported concentrations for DDT are above the solubility limit (i.e., fully saturated), and that one sample is over three orders of magnitude above saturation. Integral Consulting Inc. (2003) speculated that DDT concentrations elevated above saturation may have been high-biased "because the groundwater samples were collected using Geoprobe® temporary well screens," which could have introduced fine material. However, they do note that the exceedances of DDT solubility are collocated with samples of elevated chlorobenzene, which they indicated is a likely co-solvent interaction between DDT and chlorobenzene. **Figure 1** shows the locations where elevated contaminant concentrations in groundwater samples indicate the potential presence of NAPL through this secondary line of evidence.

Upland NAPL Plume Evaluation

Evaluating the presence of NAPL in upland soil adjacent to the Willamette River provides evidence of potential sources of NAPL migrating to sediment offshore of the Arkema site. Dense non-aqueous phase liquid (DNAPL) plumes have been identified and characterized in the uplands of the Arkema site (Environmental Resources Management [ERM], 2005). DNAPL was identified by visual observation along with OVM readings that were then validated by Sudan IV Hydrophobic Dye testing. Ultimately, zones of residual DNAPL were characterized by OVM readings greater than 500 ppm, sheen visually evident on soil particles, and the confirmed presence of brown or red droplets in the soil sample (referred to in the ERM report as ganglia or microglobules). Note that Cohen & Mercer (1993) identify a range of OVM readings that may infer the presence of NAPL from 100 to 1,000 ppm.

Two major DNAPL plumes were identified in the uplands of the Arkema site. One plume was identified beneath the former Manufacturing Process Residue (MPR) Pond and Trench, and another plume was identified just upstream of Dock 2 bordering the edge of the river bank (see ERM figure in **Attachment C**). Cross sections generated from borehole logs show a gravitational

pathway along a sloped silt layer for the NAPL to travel in a north/northeasterly direction from the former pond area toward the river.

Evaluation Findings

Evidence for the presence of NAPL, both through direct physical and supporting ancillary (i.e., secondary) evidence, has been documented within the in-water sediments adjacent to the Arkema site. NAPL has been documented through direct visual evidence in six sediment core logs where terms such as NAPL, black oily material, black bands, and oil globules were used to describe this material. Most notably, in the Phase II sediment investigation, it was noted that the observed NAPL was "characteristic of DDT manufacturing process residue" (Integral Consulting Inc., 2003). Also, while many observations made in borehole cores are from a single discreet depth, oily globules observed in WB-35 were noted repeatedly from a depth of 8 to 19 ft bml, indicating a vertical distribution of the NAPL plume of 11 feet.

In support of the visual evidence documented for the presence of NAPL, there are multiple lines of ancillary evidence from the sediment investigations. There were a total of 9 sediment core logs that documented the presence of sheen accompanied with moderate to strong odor, and OVM readings above 100 ppm, a concentration criteria outlined in Cohen & Mercer (1993) as evidence that may infer the presence of NAPL.

Groundwater concentrations of chlorobenzene and 4,4'-DDT also support the visual documentation of NAPL. Chlorobenzene concentrations greater than 1% solubility were identified in three TZW samples and seven borehole groundwater samples. Elevated chlorobenzene results from the 2003 Phase II sediment investigation were described as being the result of, "DNAPL fluids likely migrated along more permeable sand beds within the finer-grained and less permeable sediments that slope to the southeast and generally emulated the slope of the basalt surface in the near shore area" (Integral, 2003). 4,4'-DDT concentrations greater than 1% solubility were identified in four TZW samples and 14 borehole groundwater samples, 11 of which were above 100% solubility concentrations.

Based on the primary line of evidence (visual observation), and secondary lines of evidence (sheen/odor with accompanying elevated OVM readings and elevated TZW and groundwater contaminant concentrations in excess of 1% solubility), NAPL appears to be present in the inwater sediment adjacent to the Arkema site. **Figure 1** identifies the locations with primary evidence of NAPL (i.e., visual indications) and locations with secondary evidence of NAPL (i.e., sheen/odor with accompanying elevated OVM readings and elevated TZW and groundwater contaminant concentrations in excess of 1% solubility).

References

CDM Federal Programs Corporation. 2010. Field Oversight Report for 2009 Arkema EE/CA Investigation. Prepared for U.S. Environmental Protection Agency Region 10. Contract No. EP-W-049. November 30, 2010.

Cohen, R.M., and J.W. Mercer. 1993. *DNAPL Site Evaluation*. C.K. Smoley and CRC Press, Boca Raton, Florida.

Environmental Resources Management (ERM). 2005. Upland Remedial Investigation Report Lots 3 & 4 and Tract A – Revision 1. Prepared for Arkema, Inc., Portland, Oregon.

Integral Consulting Inc. 2003. Phase II Stage 1 & 2 In-River Groundwater and Sediment Investigation Report: Volume 1 – Report and Appendix A. Prepared for Atofina Chemicals Inc., Portland, Oregon.

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Lower Willamette Group (LWG). 2005b. Appendix A, Field Core Log Sheets. In Portland Harbor RI/FS Round 2B Subsurface Sediment Field Sampling Report, Draft. Portland, Oregon. December 29, 2005.

Montgomery, J., Welkom, L. 1990. Groundwater Chemicals Desk Reference. Lewis Publishers, INC. Michigan.

Verschueren, K. 1983. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Reinhold Co, New York.

Table 1
Summary of Cores that Exhibit Evidence of NAPL Based on Field Observations
Arkema Early Action Site

			Primary Line of Evidence		Secondary Line of Evidence	
Core ID	Depth (ft bml)	NAPL Observation	NAPL Description	Sheen with Odor	Sheen/Odor Description	OVM Reading >100 ppm ¹
WB-6	11.8 - 11.9	Yes	Residual NAPL	Yes	Strong odor	>3,000
WB-11	6.5 - 7.5	Yes	Trace of dark brown oily material	Yes	Weak odor	
	13.5 - 14.5		Few black bands 1" thick		Strong odor	1,230
WB-35	8 - 9	Yes	Small brown oil globules	Yes	Weak to strong petroleum odor	
	10 - 10.8		Small brown oil globules		Moderately strong petroleum odor	
	13.2 - 13.3		Few oil globules		Sheen	139.5
	18 - 19		Oil globules		Black, heavy sheen, strong petroleum odor	
WB-36	9.5 - 10	Yes	Black oily material	Yes	Light sheen, strong chemical/decaying vegetation odor	
	16 - 18		NA		Strong chemical odor, light sheen	675
WB-39	10 - 12	No	NA	Yes	Strong chemical and decaying vegetation odor	824
WB-42	8 - 10	No	NA	Yes	Strong chemical odor	240
WB-49	3 - 4	Yes	Few small spotty brown oil globules	No	Weak odor	
C348	1-5	No	NA	Yes	Odor and light sheen in lenses	360
	(30 - 153 cm)					
C351	1 - 2.6	No	NA	Yes	Slight TPH odor/sheen	2,690
	(30 - 80 cm)					
C358	1.77 - 1.83	Yes	Black liquid	No	Oily odor	
	(54 - 56 cm)					
C360-2	2.3 - 5.9	No	NA	Yes	Small sheen florets/moderately strong chemical odor	200
	(70 - 180 cm)					
C366-2	6.6 - 9.4	No	NA	Yes	Strong odor/pesticide and stain/sheen	270
	(202 - 288 cm)					
Notos			<u> </u>			

Notes:

ft bml - feet below mudline

NA - not applicable, no NAPL observed

NAPL - non-aqueous phase liquid

OVM - organic vapor meter

ppm - parts per million

-- Indicates OVM reading was not obtained or was below the 100 ppm criteria

1) OVM screening level for NAPL (greater than 100 ppm) based on criteria

presented in DNAPL Site Evaluation (Cohen & Mercer, 1993) guidance document.



Table 2
Transition Zone Water Samples with Concentrations >1% Solubility for 4,4'-DDT or Chlorobenzene
Arkema Early Action Site

Sample ID	4,4'-DDT 1% Solubility Limit = 0.0325 μg/L ¹	Chlorobenzene 1% Solubility Limit = 5,000 μg/L ²
LWG2-T90-AP3D		12,000
LWG2-T30-AP3D		30,000
LPW-TZW3AP04D		12,000
LWG2-T30-AP2A	1.1	
LWG2-T30-AP3A	1.8	
LWG2-T30-AP3A-D	0.84	
LWG2-T90-AP3A	2.7	

Notes:

μg/L - micrograms per liter

- --- Value did not exceed 1% solubility criteria
- 1) Based on 3.25 μ g/L solubility in water from Verschueren (1983).
- 2) Based on 500,000 μ g/L solubility in water from Montgomery & Welkom (1990).



Table 3
In-Water Groundwater Samples with Concentrations >1% Solubility for 4,4'-DDT or Chlorobenzene
Arkema Early Action Site

	4,4'-DDT	Chlorobenzene
	1% Solubility Limit =	1% Solubility Limit =
Location ID	0.0325 μg/L ¹	5,000 μg/L ²
WB-1	34	
WB-2	29	
WB-4	6.5	
WB-5	65	
WB-7	66	18,000
WB-8	17	
WB-9	68	12,000
WB-10	1,900	64,000
WB-11	130	32,000
WB-13	0.49	12,000
WB-14	23	9,300
WB-18	0.51	
WB-23	0.15	
WB-25	3.6	16,000

Notes:

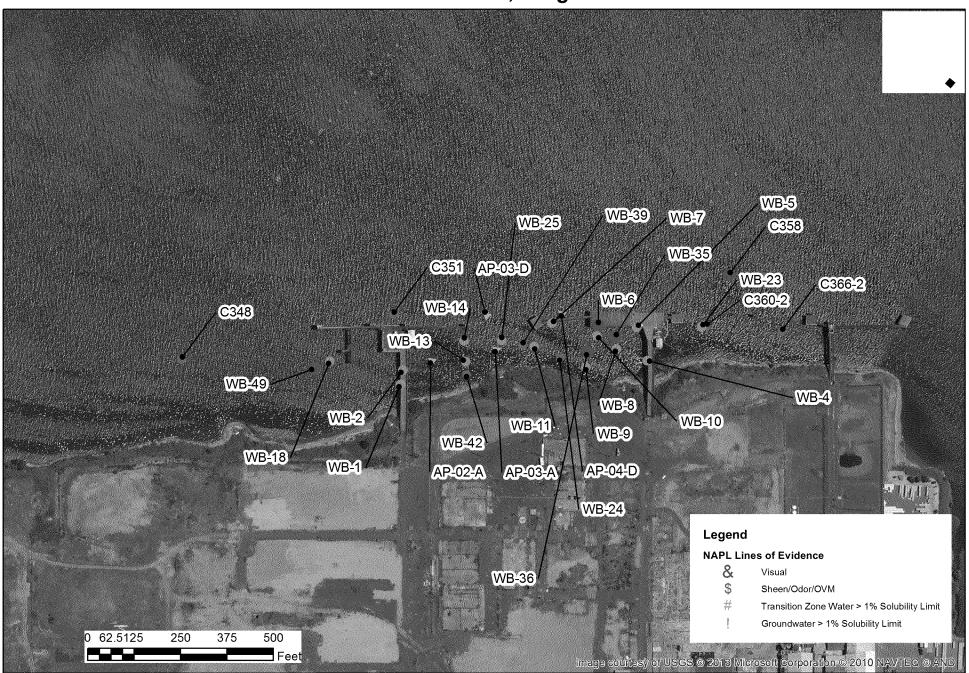
μg/L - micrograms per liter

- --- Value did not exceed 1% solubility criteria
- 1) Based on 3.25 μ g/L solubility in water from Verschueren (1983).
- 2) Based on 500,000 μg/L solubility in water from Montgomery & Welkom (1990).



Figure 1: Non-Aqueous Phase Liquid (NAPL) Evaluation Arkema Inc.

Portland, Oregon



Attachment A Sediment Core Logs Containing Visual Evidence of NAPL



Project No: 8601192.001.0634

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole: WB-6 (revised 9/02)

Ground surface: Dock #1

Geologist: Eron Dodak

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GRC SYMI	OUP BOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
они о от том от	SAMPLE NUMBER	OVM (ppm)	% RECOVE	BLOW COL	INTERVA	GRC	DUP BOL	- Mudline @ 49.1' below dock	0
1.1.1.4			, , , , , , , , , , , , , , , , , , ,						35- - - - - - - - - - - - - - - - - - -

Drilled By: Cascade Drilling

Drill Date: 7 June 2002

Well Casing Elevation: NA

Datum: City of Portland Datum - 1929

Drill Method: Direct push probe

Dock Surface Elevation: 36.56

Borehole Diameter: 2.0"

Sheet: 1 of 2



Project No: 8601192.001.0634

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole: WB-6 (revised 9/02)

Ground surface: Dock #1

Geologist: Eron Dodak

DEPTH (Feet)	SAMPLE NUMBER	OVM . (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GRO SYM		LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
40-									40
45									45
- 50 -	SO1752 SO1753	7.1 8.9	100%		X		ML	Clayey SILT, dark gray (10YR 4/1), ~15-20% clay, wet, trace (5%) tan powdery material, trace (5%) tan to light brown material, weak odor, discontinuous sheen on water.	50 -
1.1.1.	301733	0.9	0%	NA NA	\Rightarrow			Decreased clay content below 49.5' BGS. Tan powdery material absent below 51' BGS, trace (~5-10%) non-carbonized wood, tan @ 52.5-53' BGS.	
55 	SO1754	314	30%	NA	X			SILT, very dark gray (10YR 3/1), some very fine sandy silt zones (~25-35%), moist, weak to moderate odor.	55 — BACKFILLED — W/BENTONITE — GROUT —
_ _60 _	SO1755	>3000	60%	NA	X		SM	SILT, very dark gray (2.5Y 3/1), trace very fine sand, wet, ~5-10% carbonized and non-carbonized wood, strong odor.	60 7
<u>-</u> - -	No.		0%	NA	X			Silty, very fine SAND, gray (2.5Y 5/1), -10-20% silt, strong odor, residual NAPL observed from 60.9-61.0 ft. Soft probing @ 61-63'. Very soft from 63-65'.	1
65	SQ1756	1389	60%	NA	X		ML	Geoprobe rods sank to 65'. No sample collected. SILT, dark gray (7.5YR 4/1), trace fibrous	65 7
70								organics (<5%), soft, strong oder at top of sample, weak oder elsewhere, trace fine sand. Boring terminated @ 67' BGS'.	70
80							77.5		80-

Drilled By: Cascade Drilling

Well Casing Elevation: NA

Datum: City of Portland Datum - 1929

Drill Method: Direct push probe

Dock Surface Elevation: 36.56

Drill Date: 7 June 2002

Borehole Diameter: 2.0"

Sheet: 2 of 2



Project No: 8601192.001 0634

Project: ATOFINA

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole: WB-11

Ground Surface: Barge Deck

Logged By: Eron Dodak

,			,	·	·		·		pm			
DEPTH (feet)	CLEVALION (leet)	SAMPLE NUMBER	OVM (ppm)	SUDANIV	RECOVERY	INTERVAL	GRO SYMI	OUP BOL	LITHOLOGIC DESCRIPTION	BACKFILL (Bentonite grout)	DEPTH (feet)	ELEVATION (feet)
2 9	,				†			Γ	Barge Deck		_	9
- 0 -									Willamette River surface.		-0	-
- 5	5-								Windiffere River Surface.			5
-	0										- - -10	0-
L									Modling of 11 C Chalambar and ded		L	
	-	SO1963	4.4	Neg.	100%	X		ML	Mudline at 11.5 ft below barge deck. SILT, dark olive gray (5Y 3/2), trace fine sand and organics, soft, no odor. Light tan clay-rich zones, 5-10% fibrous organics.		-	-
- -15	-5-	SO1964	3.7	Neg.	100%	X			Occasional tan clay rich laminations, weak odor.		_ 15	-5
	10-	SO1965	14.8	Neg.	30%	\bigvee			As above with color dark gray (5Y 4/1), weak odd trace of dark brown oily material. As above with consolidated tan fiberous material 19 3 19 4 th below deek			
20									19.3-19.4 ft below deck.		20	
0	Orille	d By: Ca	scade	Drillin	g				Well Casing Elevation: NA	Datum: City of Portland Datu	ım - 19	929

Drill Method: Direct Push

Drill Date March 6-7, 2003

Barge Deck Elevation: 9.4 ft

Borehole Diameter: Varies

Sheet: 1 of 2



Project No: 8601192.001 0634

Project: ATOFINA

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole: WB-11

Ground Surface: Barge Deck

Logged By: Eron Dodak

DEPTH (feet) ELEVATION (feet)	SAMPLE NUMBER		SUDAN IV	RECOVERY	INTERVAL	GRO Syme		LITHOLOGIC DESCRIPTION	BACKFILL (Bentonite grout)	DEPTH (feet)	ELEVATION (feet)
-	SO1966	109	Neg.	20%	\bigvee		ML	SILT, dark gray (10YR 4/1), trace of very fine sand and fiberous organics, slightly stiff, weak to moderate odor.			
- -15 25	SO1967	1230	Neg.	60%	X			As above with 1/4" thick very fine sand rich (30-40%) zone. As above with strong odor, 5-10% fiberous material, few black bands 1" thick.		-1 -25	15-
-	SO1968	78.5	Neg.	100%	\bigvee			Trace of Silty fine SAND at bottom of sampler, dark gray (10YR 4/1), possible sheen. SILT, dark gray (10YR 4/1), trace micaceous very fine sand and carbonize/noncarbonized wood, slightly stiff, weak odor.			_
- -20 -30	SO1969	12.8	Neg.	75%	X			As above with very fine micaceous sand (10-20%), indistinct odor.		-30	- 20 —
÷	SO1970	21.4	Neg.	45%	X		SP	Slightly silty fine SAND, dark gray (2.5Y 4/1), trace wood and red grains, indistinct odor, light organic sheen at 31.7 ft only.			_
_	SO1971	13.5	Neg.	35%	M		SM Rx	As above with very fine to fine sand, no wood, moderate odor. Silty very fine SAND, olive brown (2.5Y 4/3), micaceous, 30-40% silt, piece of wood at bottom of			_
-25 35 -	-			HEREFER AND THE TOTAL AND				\unit, moderate odor. \BASALT: very dark gray (2.5Y 3/1), massive, well indurated, moderate odor. \text{Refusal on basalt at 34.0 ft below deck.} \text{Groundwater sample GW03070302 collected at 23-}		-35 -35	25 —
-				AND				27 ft below deck. Groundwater sample GW03070301 collected at 31-33.5 ft below deck.		_	-
-30 40										-3 40	30 –
Dr	illed By: Ca	scade	Drillin	g				Well Casing Elevation: NA Datum	n: City of Portland Datu	ım - 19	29
Dr	ill Method:	Direct	Push					Barge Deck Elevation: 9.4 ft			

Drill Date March 6-7, 2003

Borehole Diameter: Varies

Sheet: 2 of 2

		Scon	al solting in	(BORING NUMBER PROJECT LOCATION PROJECT NUMBER LOGGED BY	WB-35 Arkema EE/CA Portland, Oregon C167.1103 Eron J. Dodak, R.G. Page 1 of 3
	MPLE	INFORM/	-				4		
Sample	ž.	% Recovery	(mad) (IId	Sheen	and a				ASTM SEDIMENT DESCRIPTION
ARK-WB-35-0-2	1025	100	0.3	NS		M	L	Sandy SILT: very dark gray	(2.5Y 3/1), softer, 20% fine sand, no odor, no sheen.
(4.8	*********	(0-2)		**********			_	X* 49 4 8 1 199 5 5	1 (40VC 014) - The bridge up to 0 (10) long to oder to cheer.
ARK-WB-35-0-10	1310	(0-10)	*********	*****		. <u>Б</u>			ck (10YR 3/1), some twigs up to 2-1/2" long, no odor, no sheen. 3/1), soft, trace of organics (roots), no odor, no sheen.
ARK-WB-35-2-4	1045	100	1.3	NS	2-		lian P	JILI. Very Gark Gray (1011	of f, dot, and or organics (roots), no aller, no aller
		(2-4)		********				As above with 20% fine to a chemical odor at 3.0 ft bml.	medium sand, 5% fibrous organics and roots, black (10YR 2/1), weak
********************************			***********	******		5000 5000 5000 5000 5000		At 3.8" bml, as above with:	35% fine to medium sand, moderately strong chemical odor.
ADVIND OF A C	4405	76	1.3	LS*	4-			: As above with <5% fine sai	nd, very dark gray (10YR 3/1).
ARK-WB-35-4-6	1105	75 (4-6)	1.J 					Green paint chip −1/2" long	at 4.7 ft bml.
popisionespeli			***********	**********				As above with very light sp	otty sheen at 5.0 ft bml.
ARK-WB-35-6-8	1123	50	1.5	NS	6-				o sand, 10-15% fibrous light brown organic material, weak chemical
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	***********	(6-8)		*********				odor.	
************************************		*****************			8-		A		oil globules (1/32"1/16"), weak to moderately strong petroleum
ARK-WB-35-8-10	1140	75	2.5	SH*	CANADA TO			As above with small brown odor, trace of fibrous organ	
	*********	(8–10)	************					As above with no fibrous o 9.3 ft, very light spotty she	rganic material, moderately strong petroleum odor. No oil globules at
ARK-WB-35-10-12	1205	100	10.0	SH*	10-		П	Small brown oil globules (1	1/32"-1/16" observed on outside of sediment only from 10-10.8 ft bm nic material, moderately strong petroleum odor.
***********************************		(10–12)	**********			eraliza	H	Very light spotty sheen obs	
*****************************	4005-4440-440	***********	ining paragraph	 				2 4 7 7	nd. Small red paint chips observed 11.2–11.5 ft bml.
	.				12		- 1		paint chips, very light spotty sheen, moderately strong petroleum
ARK-WB-35-12-14	1245	100	139.5	LS*				odor, <2% fibrous organic	
******************************	1	(12–14)	**********	******	10000000000000000000000000000000000000			Few oil globules ~1/4" diar	neter 13.2–13,3 ft bml. No sheen below 13.5 ft bml.
ARK-WB-35-10-20	1745	100	(10-20)		ACCUPANT CONTRACT CONTRACT CONTRACT			Piece of purple plastic deb	ris ~4" diameter in drill bit at 14.0 ft bml.
ARK-WB-35-14-16	**********	*************	305.7	LS*	14			SILT: very dark gray (10YI chemical odor, no sheen o	R 3/1), soft, trace of fibrous organic material, moderately strong observed on sample*.
Drilling Contrac Drilling Method Start Time End Time				Roto 1012	t Longye -sonic 30-Sep-(19			Sampling Equipment/Notes 4" diameter x 5 ft long split spoon (0–36.1 ft bml); 4-7/8" diameter x 5 ft long solid core barrel (36.1–36.5 ft bml). Ran 6" diameter casing at 4 ft bml. Driller broke a drill rod while collecting the basalt sample (36.1–36.5 ft bml). They were able to retrieve the rod by pulling up the casing.

		91	\mathbf{d}	i (C				BORING NUMBER PROJECT Arkema EE/CA LOCATION Portland, Oregon PROJECT NUMBER C167.1103 LOGGED BY Eron J. Dodak, R.G. Page 2 of 3
SAN	/PLE	INFORM	ATION					
2 Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z	e E	% Recovery	(mdd) Gie	Sheen		Group Symbol		ASTM SEDIMENT DESCRIPTION
	***************************************						ML	As above.
***************************************	**********	*************	************	*********	16-			
ARK-WB-35-16-18	1435	70	141.4	LS*	10-			As above with 15% fine to medium sand, black (10YR 2/1), few pieces of wood debris up to 1/4 long, moderately strong chemical odor, no sheen.
******************************	*********	(16–18)	**********	**********				Very light spotty sheen, moderately strong petroleum odor.
***************************************	*********	*******	***********	3*******				very light sporty sheen, moderately shong perioleum odor.
***************************************	**********			1,200	18-		SFI	Fine to medium SAND: black (10YR 2/1), heavy sheen with oil globules 1/32 to 1/16" diameter,
ARK-WB-35-18-20	1455	100 (18–20)	12.7	HS*			3.[strong petroleum odor. Piece of metal debris ~2" long (sheet metal) at 18.2 ft bml, 2" diameter rock at 18.5 ft bml.
***************************************	*********	(10-20)	**********				ML	SILT: dark gravish brown (10YR 4/2), coarse, micaceous, no sheen, slight petroleum odor.
	**********	***********	**********	*********	00			As above, no petroleum odor, no sheen.
ARK-WB-35-20-23	1530	65	1.9	NS	20-			
**********************************	*********	(20-23)						
	********	************	**********					
	********	***************	***********	ļ	22-			
******************************	**********	***********						
ARK-WB-35-23-26	1550	55	2.2	NS				As above with fine to coarse silt.
ATT-140-33-23-20	1000	(23–26)	***********			Canada Andreas		As above with mostly fine silt, no sheen, no odor, silt has "clumpy" texture (silt clumps 1/8 to 1/
	***********	l'innermoni						diameter).

***************								As above.
	*********	*************	***********	ļ	26-	304000000000 30400000000000		As above with coarse silt (near the grain size of fine sand), no clumpy texture, no sheen, no
ARK-WB-35-26-29	1610	***********	3.8	NS.				odor.
	********	(26-29)	**********					
*****************************	*********		***********					Piece of sheet metal ~2" diameter at 27.8 ft bml.
***************************************	*********		ļ	*********	28-			
***************************************	l							
ARK-WB-35-29-32	1630	50	5.0	NS	-			Piece of crumpled sheet metal ~ 4" diameter in drill bit at 29 ft bml.
	<u> </u>	(29–32)	<u> </u>	1	<u> </u>		<u></u>	As above, no sheen, no odor. Sampling Equipment/Notes
Drilling Contrac	tor			Boar	rt Lor	igyea	r	4" diameter x 5 ft long split spoon (0-36.1 ft bml); 4-7/8"
Drilling Method				-	-son	*************		diameter x 5 ft long solid core barrel (36.1–36.5 ft bml). Ran 6" diameter casing at 4 ft bml.
Start Time End Time				- Annie Company		ep-09 ep-09		Driller broke a drill rod while collecting the basalt sample
								(36.1-36.5 ft bml). They were able to retrieve the rod by pulling up the casing.
								Very light spotty sheen only observed in mixing bowl.
	-					-	-	Land utility about any apparature in month apparature in month apparent

		Sconsu	Constitution of the consti	¥C.			BORING NUMBER WB-35 PROJECT Arkema EE/CA LOCATION Portland, Oregon PROJECT NUMBER C167.1103 LOGGED BY Eron J. Dodak, R.G. Page 3 of 3
Sample Number Number	WPLE E	LAMSOANI Recovery	ION E	Spear	SA CONTRACTOR OF THE PROPERTY		ASTM SEDIMENT DESCRIPTION (L As above.
ARK-WB-35-32-35	1700	100 (32–35) 100 (35-36.1) ~100 (36.1-36.5)	7.4	NS NS	8	▓┝	As above with mostly fine silt, no sheen, no odor. Fine sand lamination 33.10–33.15 ft bml, black (10YR 2/1). As above. Sandy GRAVEL: very dark gray (10YR 3/1), fine to 2" diameter subrounded to rounded grave 10-20% fine to coarse sand, no sheen, no odor. S" long cobble (basalt) in drill bit at 36.1 ft bml. Note: silt slough in sandy gravel. RX BASALT: black, vesicular (vesicles 1/16-3/8" diameter), moderately well indurated, orange staining on some surfaces and in some vesicles, no sheen, no odor. Borehole terminated at 36.5 ft bml.
Drilling Contractor Drilling Method Start Time End Time Boart Longyer Roto-sonic 1012 30-Sep-09 1818 30-Sep-09					sonic 30-Sep	-09	Sampling Equipment/Notes 4" diameter x 5 ft long split spoon (0–36.1 ft bml); 4-7/8 diameter x 5 ft long solid core barrel (36.1–36.5 ft bml). Ran 6" diameter casing at 4 ft bml. Driller broke a drill rod while collecting the basalt sampl (36.1-36.5 ft bml). They were able to retrieve the rod by pulling up the casing. Very light spotty sheen only observed in mixing bowl.

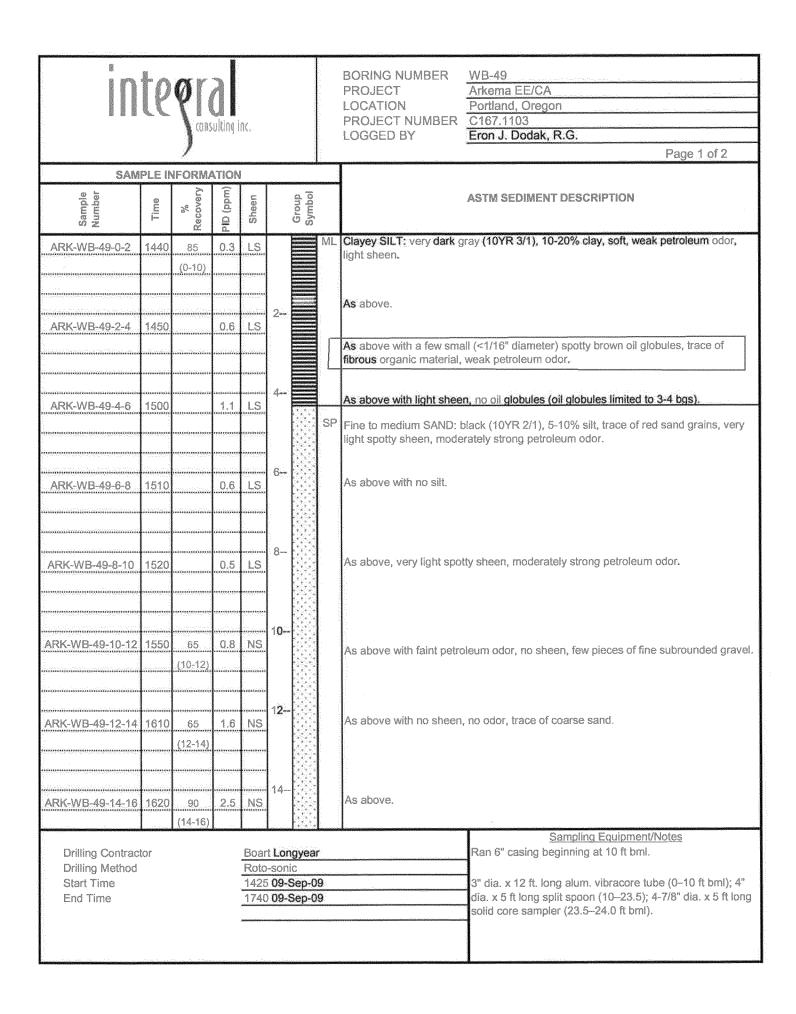
		Stans	aniting i	Ν.				BORING NUMBER PROJECT Arkema EE/CA LOCATION Portland, Oregon PROJECT NUMBER LOGGED BY Eron J. Dodak, R.G. Page 1 of 3
SAN	PLE II	VFORM/	ATION			***********		
Sam m m p e	e E E	Recovery	Q &	Sheen	(Symbol		ASTM SEDIMENT DESCRIPTION
ARK-WB-36-0-2	0920	. 60	16.6	NS			ML	Clayey SILT: very dark gray (10YR 3/1), 10% clay, soft, no sheen, slight chemical odor.
***************************************	***********	(0-2)	**********	*********				Fine to medium sand laminations ~0.05 ft thick at 1.1 and 1.3 ft bml, black (10YR 2/1), slight chemical odor.
	*********	************	**********	,	2			As above with very light spotty sheen at 2 ft bml.
ARK-WB-36-2-4	0935	100	0.7	LS*				Color black 2.7–3.0 ft bml, moderately strong chemical odor, trace of fine organics,
	***********	(2-4)	\$242348888844 834884888888	**********				light spotty sheen. Coarse silt, micaceous, no clay, moderately strong chemical odor, very light spotty sheen. 2" diameter rock at 3.5 ft bml.
ARK-WB-36-4-6	0950	75	42.1	LS*	4		/	Silt fine SAND: dk. grayish brown (10YR 4/2), very light spotty sheen, strong
**************************************		(4–6)	********	2640844475			SM	chemical odor, 25% silt. Piece of red brick ~2" diameter at 4.8 ft bml.
	***********		************	*********				As above with fine to medium sand at 5.2 ft. Few pieces of fine subrounded gravel 5.5-5.6 ft bml.
ARK-WB-36-6-8	1002	65	21.4	NS	6-			As above with 15% silt, very dark grayish brown (10YR 3/2), strong chemical/decaying vegetation odor, trace of fine subrounded gravel 6.9-7.1 ft bml.
	epper (2.1 belie)	6–8)	***********	**********	•		SP	Fine to medium SAND: black (10YR 2/1), trace of red sand grains, strong chemical/decaying vegetation odor, no sheen.
ARK-WB-36-8-10	1015	60 (8–10)	55.2	LS*	8			As above with 25% fine to 3/4" diameter subrounded gravel, piece of glass ~2" long.
	************	*************	***********	*********	10		SM	Silty fine to medium SAND with black oily material, light sheen, trace of wood debris, strong chemical/decaying vegetation odor.
ARK-WB-36-10-12			29.8	NS	10		ML	
ARK-WB-36-0-10	1420	(0–10 ft.)	compos	site)			a o	Fine to medium SAND: very dark gray (10YR 3/1), trace of red sand grains, weak
		4 A	eminos	NIC.	12			chemical odor, no sheen.
ARK-WB-35-12-14		40 (12–14)	56.6	NS.				As above with color dark gray (10YR 4/1), slight chemical odor, no sheen.
ARK-WB-35-14-16	1410	100	306	LS*	14			As above with strong chemical odor.
***************************************		(14–16)	**********					
Drilling Contract Drilling Method Start Time				Roto	t Lon -soni	С		Sampling Equipment/Notes 4" dia. x 5 ft long split spoon (0–41.9 ft bml); 4-7/8" dia. x 5 ft long solid core barrel (41.9–42.3 ft bml).
End Time				1615	5.01-0	Oct-0	9	Ran 6" dia. casing beginning at 4 ft bml *Light sheen observed on sediment only in mixing bowl.

in	te	Sr.	21 ulting i	nc.			BORING NUMBER WB-36 PROJECT Arkema EE/CA LOCATION Portland, Oregon PROJECT NUMBER C167.1103 LOGGED BY Eron J. Dodak, R.G. Page 2 of			
SAM	PLE II	VFORM/	ATION			1				
Sample Mumber 6	8	% Recovery	2 £	Sheen	9 6			ASTM SEDIMENT DESCRIPTION		
						SP	Sand (as above).			
***************************************	.004 4 6 7 4 4 8 8 7 4 7 9	****************		**********		ML	Clayey SILT: very dark grag	yish brown (10YR 3/2), soft, strong chemical odor, no sheen, 20%		
ARK-WB-36-16-18	1130	70	675.0	LS	16-	ightharpoons				
	****	(16–18)				SP	Fine to medium SAND: dar light sheen observed on se	k gray (10YR 4/1), trace of red sand grains, strong chemical odor,		
\RK-WB-36-10-22	1545	(10-22	compo	site)				•		
***********************************					18		Silt laminations at 16.6-16.	7 and 17.0-17.2 ft, very dark gray (10YR 3/1).		
\RK-WB-36-18-20	1145	100	342,1	NS	10-	<u></u>	As above.			
		(18–20)				ML	SILT: very dark gray (10YF chemical/decaying vegetat	3/1), firm, trace of fibrous organic material, moderately strong		

*******************	**********		*********		20-		Trace of orange mottling.			
RK-WB-36-20-22	1205	70	139.2	NS			As above with color black (strong chemical/decaying)	(10YR 2/1), no orange mottling, no organic material, moderately vegetation odor.		
********************************	*********	(20-22)								
*****************************	4++++++++++	*******	*******							
***********************	**********	**************	******		22-	1_	As above with a trace of fit	The same of the sa		
ARK-WB-36-22-25	1220	100	164.1	NS		SP	Fine to medium SAND: dai chemical/decaying vegetat	rk gray (10YR 4/1), trace of red sand grains, moderately strong ion odor, no sheen.		
********************************	**********	(22–25)				1	00 T. M 1. (40087 014)	ce of fibrous organic material and wood debris up to 3" long, weak		
		***********		*********		ML	chemical odor, no sheen.	ice of fibriods organic material and wood debris up to o long, weak		
************************************		************		*******	24-		Slightly lighter color helow	24 ft bml, decreased organic material content.		
*************************	********	**********	*********	*******			Slightly righter color below	24 it birit, decreased diganic material content.		
***********************	1	1		********		-	Fine to medium SAND: da	rk grayish brown (10YR 4/2), trace of red sand grains, no odor, no		
ARK-WB-36-25-28	1245	1		NS.		1 SF	sheen.	m grayion brain (terre har) allow at the case grants, in		
********************************	*******	(25–28)			26-					
********************	***********	***************************************	ļ	*******		ML	SILT: dark gray (10YR 4/1)), micaceous, coarse, trace of wood debris, no odor, no sheen.		
********************			!				As above with fine silt, 20%	% clay, no wood debris, slightly plastic.		
***************************	!	!						\$1		
NEW WED DE OD O4	4000	en		10*	28-	SF	Fine to medium SAND: ve	ry dark grayish brown (10YR 3/2), trace of wood debris up to		
ARK-WB-36-28-31	********	************	67.7	LS*			3-1/2" long, slight chemica	il odor, no sheen.		
ARK-WB-85-28-31	1310	KEUTOI.		l		1				
***************************************		************				1				
Drilling Contrac Drilling Method Start Time End Time		L		Roto 091	rt Longye o-sonic 5 01-Oct-0 5 01-Oct-0)9		Sampling Equipment/Notes 4" dia. x 5 ft long split spoon (0-41.9 ft bml); 4-7/8" dia. x 1 ft long solid core barrel (41.9-42.3 ft bml). Ran 6" dia. casing beginning at 4 ft bml		
				***************************************				*Light sheen observed on sediment only in mixing bowl.		

		Sconsi	Service Servic	K,				BORING NUMBER PROJECT LOCATION PROJECT NUMBER LOGGED BY	WB-36 Arkema EE/CA Portland, Oregon C167.1103 Eron J. Dodak, R.G. Page 3 of 3
SA	WPLE	INFORMA	TION	SSS-110-1-2-1-2-1-2-1-2-1-2-1-2-1-2-1-2-1-2					
S amport	8	% Recovery	PID (ppm)	Sheen		Group Symbol			ASTM SEDIMENT DESCRIPTION
W Z		Œ.					SP	Silt lamination 30.0–30.1 ft	bml, dark gray (10YR 3/1).
******************************	*********	************	*********	********				As above (fine to medium s	and);
*******************	**********	*************	**********	********				Silt lamination 30.5–30.6 ft	bml.
***********************************	**********	***************	*********	*********				Light spotty sheen below 30	0.6 ft bml, slight chemical odor.
ARK-WB-36-31-34	1430	85	23.8	NS.	32	-			color very dark gray (10YR 3/1), slight chemical odor,
***************************************	*********	(31–34)	Feel extended	********				no sheen.	
************************	***********	******************	*********	**********			N/I	SILT: very dark grayish bro chemical odor.	wn (10YR 3/2), trace of fibrous organic material, no sheen, faint
*****************************	**********	*****************	**********	********	34			L	y dark gray (2.5YR 3/1), trace of red sand grains, slight chemical
(41:44.434.434.434.434.434.434.434.434.434.	*********		*********					odor, no sheen.	,
ARK-WB-36-34-37	1445	65	16.8	NS.				35 (L35 1 SII T lamination	gray (2.5Y 3/1), slight chemical odor, no sheen.
******************************		(34–37)	********	********				JJ.,0-JJ. F GILF BIIII BUON,	gray (2.01 07), siigitt didilineer eeds, ne sheeti
**********************			*********	*******	36				
*********************			*********					SILT: very dark grayish bro no sheen.	wn (2.5Y 3/2), trace of wood debris, slight chemical odor,
**************************************	***********		********	**********					and), slight chemical odor, no sheen.
******************************	. 155. 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	***************	*********	440000000				W2 800A6 (IIII8 to Illedigiti s	and, sign chemical oddr, no sheen.
ARK-WB-36-37-40	1505	90	21.0	NS	38-				
	*********	(37–40)		********					
********************	**********	*****************		ļ			ML	SIL1: dark grayish brown (10YR 4/2), coarse, micaceous, no odor, no sheen.
		***********	C-2240-2444						
#\$####################################		*************			40-		GW	GRAVEL: dark gravish brou	wn (10YR 4/2), fine - 1" diameter subrounded to rounded gravel, 15
*******************************] "			medium to coarse sand, fai	
***	1535	50		NS					
***************************************		(40-41.9)						As above with 3 cobbles 2-	-1/2" to 4" diameter, subrounded to rounded.
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	**********	*******************		l'''''	100		Rx	BASALT: black, slightly ver	sicular (most vesicles <1/16" diameter), well indurated, no odor, no
*********************************	I		•	***********	42-	- 2020		sheen, trace of orange stai	
***************************************	1550	75		NS		re-income in the contract of t		Borehole terminated at 42.	3 ft bml.
***************************************	*********	(41.9–42.3)	1		1				
***************************************			ļ		1				
******************************			1*****	l	44-	-			

Drilling Contract Drilling Method Start Time End Time				Rote 091	o-sor 5 01-	ngyea nic Oct-0	19		Sampling Equipment/Notes 4" dia. x 5 ft long split spoon (0-41.9 ft bml); 4-7/8" dia. x ft long solid core barrel (41.9-42.3 ft bml). Ran 6" dia. casing beginning at 4 ft bml
				-		<u></u>			*Light sheen observed on sediment only in mixing bowl.



		Sign	ting i	K.				BORING NUMBER PROJECT LOCATION PROJECT NUMBER LOGGED BY	WB-49 Arkema EE/CA Portland, Oregon C167.1103 Eron J. Dodak, R.G. Page 2 of 2
SAMI	LEIN	FORMATI	-						
Sample Number	Time	% Recovery	PID (ppm)	Sheen		Symbol			ASTM SEDIMENT DESCRIPTION
****************************	*******	******************	*********	*********			SP	As above.	
		**************************************			16-				hann
ARK-WB-49-16-18	1635	90 (16-18)	1.8	LS.				As above, no odor, no s	neen.
((24,00)))))))))))))))	**********		***********	********			ML	Clayey SILT: very dark g petroleum odor.	gray (10YR 3/1), soft, 20% clay, very light spotty sheen, faint
ARK-WB-49-18-20	1650	50	2.5	NS.	18-		SP		very dark gray (10YR 3/1), trace of red sand grains, no odor,
	**********	(18-20)	*********	*********				no sheen.	
*************************************	*********	***************	********	********	20				
RK-WB-49-20-22	1705	75	0.9	NS	20-			As above with a few pie	ces of fine gravel, no sheen, no odor.
5/41040645/41446656446454545464665666		(20-22)							
************************************		**************	********	*******				As above with 10% fine	to 1/2" diameter subrounded to rounded gravel.
NRK-WB-49-22-23.5	1720	70	0.8	NS	22			1	y dark grayish brown (10YR 3/2), no gravel.
***************************************	***********	(22-23.5)	******					Clayey SILT: dark grayi:	sh brown (2.5Y 4/2), 10-20% clay, no odor, no sheen. At 23.
*******************************		*****************		********			ML	Image 61 mm 11 .1 If to	inded gravel up to 1.5" diameter. lurated, massive, iron staining on some surfaces, no odor or
***************************************	4740	_400		NS	24	***	Rx	sheen.	
***************************************	1740	-100 (23.5-24)	**********					Borehole terminated at	24 ft bml.

		**************			26				
***********************************		************	*******						

**************************	ļ	********	rimmer)		1				
*************************************		*****************			28-				
*******************************		***********							
*************************************		**********		ļ	1				
*******************************	*********		ļ	. Leiman	-				
	1	<u> </u>	1	1	1		<u></u>		Sampling Equipment/Notes
Drilling Contractor				Boa	rt Lor	ngyea	ır		Ran 6" casing beginning at 10 ft bml.
Drilling Method				Rote	o-son	ic			
Start Time				- SANSARAMAN AND SANS	TO SHARE WHEN THE PARTY OF THE	Sep-(Sep-(OCCUPANTS OF THE PARTY OF		3" dia. x 12 ft. long alum. vibracore tube (0-10 ft bml); 4" dia. x 5 ft long split spoon (10-23.5); 4-7/8" dia. x 5 ft long
End Time				114	<i>∪</i> ∪3*	aeh-i	72		solid core sampler (23.5–24.0 ft bml).
				Securionism				<u></u>	v



PROJECT: Portland Harbor RI/FS

Core ID: __LW2-C358_ pg |___of _____

7		
Collected:		Processed:
Date: /o/26/05	Drive Length: /2.5	Date: 10/26 /05
Time: /229	Tide Level (CRD):	Time: <u>/5 20</u>
Recovery Length: /a/	Mudline Depth: 38 2	Core Length: 303
	Vessel: R.V. Nancy Anne (MSS)	Location: FIELD LAS
Recovery Efficiency:		Crew: JS AR BP RWSF
Crew: DS DA F		CIEW. 03 ALC 137 ACC
	\	

Depth in Core	Lithologic Description:	G	rain (%	Size 6)		FID/ PID	
(cm)	(Grainsize, color, density/consistency, odor, organics, debris)	G	S	SI/CI	Photo ID	(ppm)	Sample ID
C = 30	SILT WISANA SAND IS VEINE	********	lu.	Su.	· · · · · · · · · · · · · · · · · · · ·	104]	1447 - 5358-A
walion is k ajal bali sassis	MED GRAVUSH BROWN USUFT SUFT	******	*4.44.65	enissi ikopiyaka	เล่นนี้พระสัตรเหตุรัฐ : 22 กับสุดสุดครัฐ :	140/2	(.03.0.),
******	TR METHANE VESICLES - ROTLETS	80 84×140			en i projektor vitali i svetajekom	a a agride i a conse	dexilogas. Lux.Chi
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Seguinas esplasades		s njegovićio	er kilje kalij	***********	*****************		
30 -	Sill al saus, sand y white- Fre	*******	erenie	arenis e de exercica de la constante de la con	paratripacioni cananactiva	2142	LWZ - 4358 - B
2.46	SIT AS Above, we truline the same		445	>25		√65°t	
	Solt to Still milkad-just beams as	لاياد	Σju				And the second second
PROGRAMMENTO GRANDE SERVICES.		X. 61	(3/4	AZIALA		A A FRANCISCO	kanga menteun di dibantuk dibinan mendikan dan dan dibinan dibinah dib
er den er	TRACE METHODE JESSELLS THATE	કે કહેર હતા. -	1216.11	************	**********************	Andreas	* * **********************************
	which & ~ 38cm. less of black	П				96/	LW1-C-358-C
	Linux on will only offer Some 84-56 Sum.	120	244414	**************		/55*	(152-248)
	Mile Them all old besides a ~ 13/00	H.			*** ***		Example 32
***********	Mild notion and offer begins a a 157cm and increases we depth. Red, pass pr. of.		444.44	a kilokulu sanunani	a kankasias na dan Singgan di	i e e e e e e e e e e e e e e e e e e e	***************************************
\$44\$1.KU\$\$\$\$\$1.K\$\$\$\$\$	Chip @ 179cm. FAN black staw		41,557.64	ii	alda koli sakki kibari ka	ijas Seri lika	
	band (Ten Thick) C 212 cm:		La Life ex	*************	******	a de la composición dela composición de la compo	น้ำได้เกาได้เกาะก็กลได้เพื่อให้เกิดเลืองสอบที่สามารถเลืองสอบสอบที่สามารถเลืองสอบที่สามารถเลืองสอบที่
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Core se	gment breaks at (cm): 7 - 10 - 110 - 218 - 218 -	- 7	13				<i>></i> €

Attachment B Sediment Core Logs Containing Secondary Evidence of NAPL



Project No: 8601192.001.0634

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole: WB-6 (revised 9/02)

Ground surface: Dock #1

Geologist: Eron Dodak

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GRC SYMI	OUP BOL	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
								- Mudline @ 49.1' below dock	0
Ē								Indulino & 40.11 Boldin dobk	1
5									} 5
									2 - I - I - I - I - I - I - I - I - I -
- - - 10									10-1
15									15
									10 10 15 15 15 17 17 17 17 17
 - -20 -									
- Î									20-7
_ _ _ 25									
E 23									25 <u>-</u> - -
									30-
									1
-35 -1									35— - - - - - - -
40									40-

Drilled By: Cascade Drilling

Well Casing Elevation: NA

Datum: City of Portland Datum - 1929

Drill Method: Direct push probe

Dock Surface Elevation: 36.56

Drill Date: 7 June 2002

Borehole Diameter: 2.0"

Sheet: 1 of 2



Project No: 8601192.001.0634

Project: Acid Plant RI

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole: WB-6 (revised 9/02)

Ground surface: Dock #1

Geologist: Eron Dodak

DEPTH (Feet)	SAMPLE NUMBER	OVM (ppm)	% RECOVERY	BLOW COUNT	INTERVAL	GR(SYM		LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION DETAIL
40	SO1752	7.1	100%	NA	X		ML	Clayey SILT, dark gray (10YR 4/1), ~15-20 % clay, wet, trace (5%) tan powdery material, trace	40
. / . / . / . / . / . / . / . / . / . /	SO1753	8.9	100%				Trofff to the second control of the second c	(5%) tan to light brown material, weak odor, discontinuous sheen on water. Decreased clay content below 49.5' BGS. Tan powdery material absent below 51' BGS, trace (~5-10%) non-carbonized wood, tan @ 52.5-53' BGS.	11-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1
11111	SO1754	314	30%		\bigvee	Min de la constanta de la cons		SILT, very dark gray (10YR 3/1), some very fine sandy silt zones (~25-35%), moist, weak to moderate odor. SILT, very dark gray (2.5Y 3/1), trace very fine	BACKFILLED - GROUT - G
-60 -1-1-1-1	SO1755	>3000	60% 0%	NA NA	$\stackrel{\sim}{\mathbb{X}}$		SM	sand, wet, ~5-10% carbonized and non- carbonized wood, strong odor. Silty, very fine SAND, gray (2.5Y 5/1), ~10-20% silt, strong odor, residual NAPL observed from 60.9-61.0 ft. Soft probing @ 61-63', Very soft from 63-65'.	60 11111
-65 -1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	SO1756	1389	60%	NA	X		ML	Geoprobe rods sank to 65'. No sample collected. SILT, dark gray (7.5YR 4/1), trace fibrous organics (<5%), soft, strong odor at top of sample, weak odor elsewhere, trace fine sand. Boring terminated @ 67' BGS'.	65
- -70 - - - - - - - - - - - - - - - - -									70 — - - - - - -
									75 -
- - -80	es.								

Drilled By: Cascade Drilling

Well Casing Elevation: NA

Datum: City of Portland Datum - 1929

Drill Method: Direct push probe

Dock Surface Elevation: 36.56

Drill Date: 7 June 2002

Borehole Diameter: 2.0"

Sheet: 2 of 2



Project No: 8601192.001 0634

Project: ATOFINA

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole: WB-11

Ground Surface: Barge Deck

Logged By: Eron Dodak

ELEVATION (feet) SUDAN IV SUDAN IV RECOVERY INTERVAL	LITHOLOGIC DESCRIPTION	BACKFILL (Bentonite grout)	DEPTH (feet) ELEVATION (feet)
8	Barge Deck		0 9
	Willamette River surface.		- - - -
- - -5			- - 5-
- - - -10			- - 0-
SO1963 4.4 Neg. 100%	Mudline at 11.5 ft below barge deck. SILT, dark olive gray (5Y 3/2), trace fine sand and organics, soft, no odor. Light tan clay-rich zones, 5-10% fibrous organics.		-
5 SO1964 3.7 Neg. 100%	Occasional tan clay rich laminations, weak odor.		- -5− -15
SO1965 14.8 Neg. 30%	As above with color dark gray (5Y 4/1), weak odor, trace of dark brown oily material.		- - - -
-10-	As above with consolidated tan fiberous material 19.3-19.4 ft below deck.		- -10 20

Drilled By: Cascade Drilling

Drill Method: Direct Push

Drill Date March 6-7, 2003

Barge Deck Elevation: 9.4 ft

Borehole Diameter: Varies

Sheet: 1 of 2



Project No: 8601192.001 0634

Project: ATOFINA

Client: ATOFINA Chemicals, Inc.

Location: Portland, OR

Borehole: WB-11

Ground Surface: Barge Deck

Logged By: Eron Dodak

DEPTH (feet)	ELEVATION (feet)	SAMPLE NUMBER	OVM (ppm)	SUDAN IV	RECOVERY	INTERVAL	GROUP SYMBOL	LITHOLOGIC DESCRIPTION	BAÇKFILL (Bentonite grout)	DEPTH (feet)	ELEVATION (feet)
-	-	SO1966	109	Neg.	20%	\bigvee	ML	SILT, dark gray (10YR 4/1), trace of very fine sand and fiberous organics, slightly stiff, weak to moderate odor.		_	-
- 25	-15	SO1967	1230	Neg.	60%	X		As above with ½" thick very fine sand rich (30-40%) zone. As above with strong odor, 5-10% fiberous material, few black bands 1" thick.		-1 -25	15-
	-	SO1968	78.5	Neg.	100%	X		Trace of Silty fine SAND at bottom of sampler, dark gray (10YR 4/1), possible sheen. SILT, dark gray (10YR 4/1), trace micaceous very fine sand and carbonize/noncarbonized wood, slightly stiff, weak odor.		-	-
- 30	-20	SO1969	12.8	Neg.	75%	X		As above with very fine micaceous sand (10-20%), indistinct odor.		- -2	- 20—
	1	SO1970	21.4	Neg.	45%	X	SP	Slightly silty fine SAND, dark gray (2.5Y 4/1), trace wood and red grains, indistinct odor, light organic sheen at 31.7 ft only.		-	-
-	-25 —	SO1971	13.5	Neg.	35%	M	TTT SM	As above with very fine to fine sand, no wood, moderate odor. Silty very fine SAND, olive brown (2.5Y 4/3), micaceous, 30-40% silt, piece of wood at bottom of unit, moderate odor.		- - -2	25 —
- 35	1				The state of the s			BASALT: very dark gray (2.5Y 3/1), massive, well indurated, moderate odor. Refusal on basalt at 34.0 ft below deck. Groundwater sample GW03070302 collected at 23-27 ft below deck.		-35 -	1
-					SECURIOR SECU			Groundwater sample GW03070301 collected at 31-33.5 ft below deck.		- -	1
-40	-30 —									-3 -40	30-
	Drill	ed By: Ca	scade	Drillin	g			Well Casing Elevation: NA Datum	: City of Portland Datu	ım - 19	129

Drill Method: Direct Push

Drill Date March 6-7, 2003

Barge Deck Elevation: 9.4 ft

Borehole Diameter: Varies

Sheet: 2 of 2

İn		Scott	al Sulting in	((BORING NUMBER PROJECT LOCATION PROJECT NUMBER LOGGED BY	WB-35 Arkema EE/CA Portland, Oregon C167.1103 Eron J. Dodak, R.G. Page 1 of 3
SAI	APLE	INFORM/	ATION						
Sample English	© 000 000 000 1000 1000	% Recovery	PID (ppm)	Sheen	Group	Symbol			ASTM SEDIMENT DESCRIPTION
ARK-WB-35-0-2	1025	100 (0–2)	0.3	NS			ИL	Sandy SILT: very dark gray	(2.5Y 3/1), softer, 20% fine sand, no odor, no sheen.
ARK-WB-35-0-10	1310	(0-10)	***********	********		T s	3P	Fine to medium SAND: blac	k (10YR 3/1), some twigs up to 2-1/2" long, no odor, no sheen,
***************************************			5 6 4 4 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6		2-		VIL	SILT: very dark gray (10YR	3/1), soft, trace of organics (roots), no odor, no sheen.
ARK-WB-35-2-4	1045	100 (2–4)	1.3	NS.				As above with 20% fine to me chemical odor at 3.0 ft bml.	nedium sand, 5% fibrous organics and roots, black (10YR 2/1), weak
*****************************	**********	************	***********	******	100000 100000 100000			At 3.8" bml, as above with 3	5% fine to medium sand, moderately strong chemical odor.
ARK-WB-35-4-6	1105	75	1.3	LS*	4-			As above with <5% fine san	d, very dark gray (10YR 3/1).
		(4-6)	***************	*********	100000 100000 100000 100000			Green paint chip ~1/2" long	
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			************					As above with very light spo	otty sheen at 5.0 ft bml.
ARK-WB-35-6-8	1123	50 (6-8)	1.5	NS	6-			As above with no sheen, no odor.	sand, 10-15% fibrous light brown organic material, weak chemical
ARK-WB-35-8-10	1140	75 (8–10)	2.5	SH*	8			odor, trace of fibrous organi	ganic material, moderately strong petroleum odor. No oil globules a
ARK-WB-35-10-12		100	10.0	SH*	10-		Constitution of the last of th	Small brown oil globules (1/ 10–15% roots/fibrous organ	/32"-1/16" observed on outside of sediment only from 10-10.8 ft bm nic material, moderately strong petroleum odor.
***************************************	*********	(10–12)						Very light spotty sheen obs	AND THE PROPERTY OF THE PROPER
*******************************	dedyakinkan	************	************	ļ					nd. Small red paint chips observed 11.2–11.5 ft bml.
	4045		400 5	l	12			1	paint chips, very light spotty sheen, moderately strong petroleum
ARK-WB-35-12-14	1245	100 (12–14)	139.5	LS*				odor, <2% fibrous organic r	naterial.
*****************************	**********		***************************************	********				Few oil globules ~1/4" diam	neter 13.2–13,3 ft bml. No sheen below 13.5 ft bml.
ARK-WB-35-10-20	1745	100	(10-20)	T			£	Application and State Section 1	is ~4" diameter in drill bit at 14.0 ft bml.
ARK-WB-35-14-16	******	*************	305.7	LS*	14			SILT: very dark gray (10YR chemical odor, no sheen of	3/1), soft, trace of fibrous organic material, moderately strong bserved on sample*.
							····		Sampling Equipment/Notes
Drilling Contract Drilling Method Start Time End Time				Roto 1012	t Longy -sonic 30-Sep 30-Sep	-09			4" diameter x 5 ft long split spoon (0–36.1 ft bml); 4-7/8" diameter x 5 ft long solid core barrel (36.1–36.5 ft bml). Ran 6" diameter casing at 4 ft bml. Driller broke a drill rod while collecting the basalt sample (36.1-36.5 ft bml). They were able to retrieve the rod by pulling up the casing.
									Very light spotty sheen only observed in mixing bowl.

		91	\mathbf{d}	i (C				BORING NUMBER PROJECT Arkema EE/CA LOCATION Portland, Oregon PROJECT NUMBER C167.1103 LOGGED BY Eron J. Dodak, R.G. Page 2 of 3
SAN	/PLE	INFORM	ATION					
2 Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z	e E	% Recovery	(mdd) Gie	Sheen		Group Symbol		ASTM SEDIMENT DESCRIPTION
	***************************************						ML	As above.
***************************************	**********	*************	************	*********	16-			
ARK-WB-35-16-18	1435	70	141.4	LS*	10-			As above with 15% fine to medium sand, black (10YR 2/1), few pieces of wood debris up to 1/4 long, moderately strong chemical odor, no sheen.
******************************	*********	(16–18)	**********	**********				Very light spotty sheen, moderately strong petroleum odor.
***************************************	*********	*******	***********	3*******				very light sporty sheen, moderately shong perioleum odor.
***************************************	**********		40.7	1,200	18-		SFI	Fine to medium SAND: black (10YR 2/1), heavy sheen with oil globules 1/32 to 1/16" diameter,
ARK-WB-35-18-20	1455	100 (18–20)	12.7	HS*			3.[strong petroleum odor. Piece of metal debris ~2" long (sheet metal) at 18.2 ft bml, 2" diameter rock at 18.5 ft bml.
***************************************	*********	(10-20)	**********				ML	SILT: dark gravish brown (10YR 4/2), coarse, micaceous, no sheen, slight petroleum odor.
	**********	***********	**********	*********	00			As above, no petroleum odor, no sheen.
ARK-WB-35-20-23	1530	65	1.9	NS	20-			
**********************************	*********	(20-23)						
	********	************	*********					
	********	***************	***********	ļ	22-			
******************************	**********	***********						
ARK-WB-35-23-26	1550	55	2.2	NS				As above with fine to coarse silt.
ATT-140-33-23-20	1000	(23–26)	***********			Canada Andreas		As above with mostly fine silt, no sheen, no odor, silt has "clumpy" texture (silt clumps 1/8 to 1/
	***********	l'innermani						diameter).

***************								As above.
	*********	*************	**********	ļ	26-	304000000000 30400000000000		As above with coarse silt (near the grain size of fine sand), no clumpy texture, no sheen, no
ARK-WB-35-26-29	1610	***********	3.8	NS.				odor.
	********	(26-29)	**********					
*****************************	*********		***********					Piece of sheet metal ~2" diameter at 27.8 ft bml.
***************************************	*********		ļ	*********	28-			
***************************************	l			1				
ARK-WB-35-29-32	1630	50	5.0	NS	-			Piece of crumpled sheet metal ~ 4" diameter in drill bit at 29 ft bml.
	<u> </u>	(29–32)	<u> </u>	1	<u> </u>		<u></u>	As above, no sheen, no odor. Sampling Equipment/Notes
Drilling Contrac	tor			Boar	rt Lor	igyea	r	4" diameter x 5 ft long split spoon (0-36.1 ft bml); 4-7/8"
Drilling Method				-	-son	**************		diameter x 5 ft long solid core barrel (36.1–36.5 ft bml). Ran 6" diameter casing at 4 ft bml.
Start Time End Time				- Annie Company		ep-09 ep-09		Driller broke a drill rod while collecting the basalt sample
								(36.1-36.5 ft bml). They were able to retrieve the rod by pulling up the casing.
								Very light spotty sheen only observed in mixing bowl.
	-					-	-	Land utility about any apparature in month apparature in month apparent

		Sconso	Executive Section 1.					BORING NUMBER PROJECT LOCATION PROJECT NUMBER LOGGED BY	WB-35 Arkema EE/CA Portland, Oregon C167.1103 Eron J. Dodak, R.G. Page 3 of 3				
Sample Number	APLE e E	INFORMAT	TON Edd Q	Sheer		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		ASTM SEDIMENT DESCRIPTION					
RK-WB-35-32-35	1700	100 (32-35) 100 (35-36.1) -100 (36.1-36.5)	7.4	NS.	38-		_ GW	As above. Sandy GRAVEL: very dark 10-20% fine to coarse sand 5" long cobble (basalt) in d	gray (10YR 3/1), fine to 2" diameter subrounded to rounded graved, no sheen, no odor. rill bit at 36.1 ft bml. Note: silt slough in sandy gravel. vesicles 1/16-3/8" diameter), moderately well indurated, orange and in some vesicles, no sheen, no odor.				
Drilling Contract Drilling Method Start Time End Time	tor		Boart Longyear Roto-sonic 1012 30-Sep-09 1818 30-Sep-09			c ep-09	************		4" diameter x 5 ft long split spoon (0–36.1 ft bml); 4-7/8" diameter x 5 ft long solid core barrel (36.1–36.5 ft bml). Ran 6" diameter casing at 4 ft bml. Driller broke a drill rod while collecting the basalt sample (36.1-36.5 ft bml). They were able to retrieve the rod by pulling up the casing. Very light spotty sheen only observed in mixing bowl.				

		Stans	aniting i	Ν.				BORING NUMBER PROJECT Arkema EE/CA LOCATION Portland, Oregon PROJECT NUMBER LOGGED BY Eron J. Dodak, R.G. Page 1 of 3
SAN	PLE II	VFORM/	ATION			***********		
Sam m m p e	e E	Recovery	Q &	Sheen	(Symbol		ASTM SEDIMENT DESCRIPTION
ARK-WB-36-0-2	0920	. 60	16.6	NS			ML	Clayey SILT: very dark gray (10YR 3/1), 10% clay, soft, no sheen, slight chemical odor.
***************************************	***********	(0-2)	**********	*********				Fine to medium sand laminations ~0.05 ft thick at 1.1 and 1.3 ft bml, black (10YR 2/1), slight chemical odor.
	*********	************	**********	,	2			As above with very light spotty sheen at 2 ft bml.
ARK-WB-36-2-4	0935	100	0.7	LS*				Color black 2.7–3.0 ft bml, moderately strong chemical odor, trace of fine organics,
	***********	(2-4)	\$242348888844 834884888888	**********				light spotty sheen. Coarse silt, micaceous, no clay, moderately strong chemical odor, very light spotty sheen. 2" diameter rock at 3.5 ft bml.
ARK-WB-36-4-6	0950	75	42.1	LS*	4		/	Silt fine SAND: dk. grayish brown (10YR 4/2), very light spotty sheen, strong
**************************************		(4–6)	********	2640844475			SM	chemical odor, 25% silt. Piece of red brick ~2" diameter at 4.8 ft bml.
	***********		************	*********				As above with fine to medium sand at 5.2 ft. Few pieces of fine subrounded gravel 5.5-5.6 ft bml.
ARK-WB-36-6-8	1002	65	21.4	NS	6-			As above with 15% silt, very dark grayish brown (10YR 3/2), strong chemical/decaying vegetation odor, trace of fine subrounded gravel 6.9-7.1 ft bml.
	epper (2.1 belie)	6–8)	***********	**********	•		SP	Fine to medium SAND: black (10YR 2/1), trace of red sand grains, strong chemical/decaying vegetation odor, no sheen.
ARK-WB-36-8-10	1015	60 (8–10)	55.2	LS*	8			As above with 25% fine to 3/4" diameter subrounded gravel, piece of glass ~2" long.
	************	*************	***********	*********	10		SM	Silty fine to medium SAND with black oily material, light sheen, trace of wood debris, strong chemical/decaying vegetation odor.
ARK-WB-36-10-12			29.8	NS	10		ML	
ARK-WB-36-0-10	1420	(0–10 ft.)	compos	site)			a o	Fine to medium SAND: very dark gray (10YR 3/1), trace of red sand grains, weak
		4 A	eminos	NIC.	12			chemical odor, no sheen.
ARK-WB-35-12-14		40 (12–14)	56.6	NS.				As above with color dark gray (10YR 4/1), slight chemical odor, no sheen.
ARK-WB-35-14-16	1410	100	306	LS*	14			As above with strong chemical odor.
***************************************		(14–16)	**********					
Drilling Contract Drilling Method Start Time				Roto	t Lon -soni	С		Sampling Equipment/Notes 4" dia. x 5 ft long split spoon (0–41.9 ft bml); 4-7/8" dia. x 5 ft long solid core barrel (41.9–42.3 ft bml).
End Time				1615	5.01-0	Oct-0	9	Ran 6" dia. casing beginning at 4 ft bml *Light sheen observed on sediment only in mixing bowl.

	te	Sr.		ĸ.			BORING NUMBER PROJECT LOCATION PROJECT NUMBER LOGGED BY	WB-36 Arkema EE/CA Portland, Oregon C167.1103 Eron J. Dodak, R.G. Page 2 of 3		
SAM	PLE II	VFORM	ATION	1						
Sample Number Time % Recovery (ppm) Sheen Group								ASTM SEDIMENT DESCRIPTION		
							Sand (as above).			
*********************************			***********			ML	Clayey SILT: very dark gra	yish brown (10YR 3/2), soft, strong chemical odor, no sheen, 20%		
ARK-WB-36-16-18	1130	70	675.0	LS	16-7	ightharpoonup				
	*******	(16–18)		*******		SP	Fine to medium SAND: dail	rk gray (10YR 4/1), trace of red sand grains, strong chemical odor,		
ARK-WB-36-10-22	1545	(10-22	compo	osite)				•		
					18-		Silt laminations at 16.6-16.7 and 17.0-17.2 ft, very dark gray (10YR 3/1).			
ARK-WB-36-18-20	1145	100	342,1	NS	10-	As above.				
		(18–20)				ML	SILT: very dark gray (10YF chemical/decaving vegetat	R 3/1), firm, trace of fibrous organic material, moderately strong		
**************************			*********	*********	20-		Trace of orange mottling.			
ARK-WB-36-20-22	1205	70	139.2			As above with color black (10YR 2/1), no orange mottling, no organic material, moderately strong chemical/decaying vegetation odor.				
	44444644	(2022)		*********						
******************************	*********	*******	********							
	******	**************	********		22-	<u> </u>	As above with a trace of file	The same of the sa		
ARK-WB-36-22-25	1220	100	164.1	NS		SP	Fine to medium SAND: da chemical/decaying vegetal	rk gray (10YR 4/1), trace of red sand grains, moderately strong tion odor, no sheen.		
		(22–25)	ļ			1	00 T. L	ace of fibrous organic material and wood debris up to 3" long, weak		
	*********	***********		**********		ML	chemical odor, no sheen.	to the first of the state of th		
#~************************************				******	24-		Slightly lighter color helow	24 ft bml, decreased organic material content.		
*****************************	********	***********					Oliginia rigistor coror poron	art tom, acondace organic meterial contains		
********************************	1	1		********			Fine to medium SAND: da	rk grayish brown (10YR 4/2), trace of red sand grains, no odor, no		
ARK-WB-36-25-28	1245	1		NS		l or	sheen.	, , , , , , , , , , , , , , , , , , ,		
	*******	(25–28)			26-					
*************************	**********	**********	ļ	******		MIL	SILT: dark gray (10YR 4/1), micaceous, coarse, trace of wood debris, no odor, no sheen,		
			!	*********			As above with fine silt, 20°	% clay, no wood debris, slightly plastic.		
***************************************	!			ļ				₽		
ADV MD 20 00 04	12NE	an	677	LS*	28-	SF	Fine to medium SAND: ve	ry dark grayish brown (10YR 3/2), trace of wood debris up to		
ARK-WB-36-28-31 ARK-WB-85-28-31	********	80 (28–31	67.7	1-3.		1	3-1/2" long, slight chemica	al odor, no sheen.		
ARR-VVD-00-20-01	1310	Keutui L	†	*******		1				

	L	<u> </u>	1	<u> </u>		1		Sampling Equipment/Notes		
Drilling Contrac				CHARGO CONTRACTOR	rt Longyea	ır		4" dia. x 5 ft long split spoon (0-41.9 ft bml); 4-7/8" dia. x 5 ft long solid core barrel (41.9-42.3 ft bml).		
Drilling Method Start Time				Name and Address of the Owner, where	o-sonic 5 01-Oct-0	191		it long solid core parter (*1.3***2.3 it bini).		
End Time				-	5 01-Oct-0	-				
				***************************************				Ran 6" dia. casing beginning at 4 ft bml *Light sheen observed on sediment only in mixing bowl.		
								Fight sheet observed on sediment only in mixing bown.		
								San Santa Stage shows that San Santa shows the		

integral consulting inc.								BORING NUMBER PROJECT LOCATION PROJECT NUMBER LOGGED BY	WB-36 Arkema EE/CA Portland, Oregon C167.1103 Eron J. Dodak, R.G. Page 3 of 3							
SA	WPLE	INFORMA	ПОМ													
Sample Number Time Recovery PID (ppm) Sheen Group						Symbol		ASTM SEDIMENT DESCRIPTION								
~		<u> </u>		-			SP	Silt lamination 30.0–30.1 ft	bml, dark gray (10YR 3/1).							
***************************	*********	************	********	********	*			As above (fine to medium s	eand);							
**************	**********	*****************	******	*********				Silt lamination 30.5–30.6 ft	bml.							
*****************	*********	****************	********	*********					0.6 ft bml, slight chemical odor.							
RK-WB-36-31-34	1430	85	23.8	NS	32				color very dark gray (10YR 3/1), slight chemical odor,							
************************************		(31–34)	ř. .	********				no sheen.	tory dan gray (1011torry angritorial and out)							
**************************************	************		*********	**********			ML	1	wn (10YR 3/2), trace of fibrous organic material, no sheen, faint							
**********************************		******************	********	*********	34			L	y dark gray (2.5YR 3/1), trace of red sand grains, slight chemical							
***************************************	*********	****************	*********		*			odor, no sheen.								
\RK-WB-36-34-37	1445	65	16.8	NS.	2			35 0–35.1 SILT lamination.	gray (2.5Y 3/1), slight chemical odor, no sheen.							
***************************	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(34–37)	********	*******				out the second	3.43 (4.6.1. 0.7), 0.13.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1							
*****************************			********	*******	36											
****************************				******	*			I .	wn (2.5Y 3/2), trace of wood debris, slight chemical odor,							
	**********	**************		*********				no sheen.	D. P. Marka at a facility of a second							
	**********	************************	********					As above (fine to medium s	sand), slight chemical odor, no sheen.							
ARK-WB-36-37-40	1505	90	21.0	NS	38											
	terrore en	(37–40)														
							ML	SILT: dark grayish brown (10YR 4/2), coarse, micaceous, no odor, no sheen.							
.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,																
***************************************					100		CIM	CDAVEL dock assuigh has	wn (10YR 4/2), fine - 1" diameter subrounded to rounded gravel, 18							
***************************************		****************					GVV	medium to coarse sand, fai	int odor, no sheen.							
**************************************	1535	1		NS												
<u></u>		(40–41.9)						As above with 3 cobbles 2-	-1/2" to 4" diameter, subrounded to rounded.							
*************************************	*******	l	***********	********			Rx	BASALT: black, slightly ve	sicular (most vesicles <1/16" diameter), well indurated, no odor, no							
********************************		1	l	f*******	42\$	X	_	sheen, trace of orange stai								
***************************************	1550	75		NS	1			Borehole terminated at 42.	3 ft bml.							
*******************************		(41.9–42.3)		1.11.20	1											
**********************		1			1											
*******************************					44											
************************	*******		*******	 	1											
	<u></u>	J	L	L			<u></u>		Sampling Equipment/Notes							
Drilling Contra	ctor			Boa	rt Long	yea	r		4" dia. x 5 ft long split spoon (0-41.9 ft bml); 4-7/8" dia. >							
Drilling Method				*************	-sonic				ft long solid core barrel (41.9–42.3 ft bml).							
Start Time				- Printer Commence	5 01-0	***************************************	**********		-							
End Time				101	5 01-0	UE-U	J.		Ran 6" dia. casing beginning at 4 ft bml							
				-					*Light sheen observed on sediment only in mixing bowl.							

in	te	Cons		*				BORING NUMBER PROJECT LOCATION PROJECT NUMBER LOGGED BY	WB-39 Arkema EE/CA Portland, Oregon C167.1103 Eron J. Dodak, R.G. Page 1 of 2
SAM	PLE IN	VFORM/	ATION						
0 Z	E	% Recovery	(med)	Sheen		Group Symbol			ASTM SEDIMENT DESCRIPTION
ARK-WB-39-0-2	1525	50	0.4	NS.			GW	fine to 3/4" angular grav	ery dark gray (10YR 3/1), 40% silt, 10% fine to coarse sand, vel, trace of fibrous organic material (light brown), trace of ris up to 1/4" dia., no odor, no sheen.
ARK-WB-39-2-4	1545	75 (2–4)	0.6	LS	2		ML	SILT: very dark gray (10 very light spotty sheen,	OYR 3/1), 10% wood debris and fine fibrous organic material, slight chemical odor.
ARK-WB-39-0-8	1710	(0–8 ft c	compo	site)		\equiv		Piece of rock ~4" diame	stor at 3.0 ft hml
ARK-WB-39-4-6	1606	90 (4–6)	4.0	NS	4			As above with color dar	k gray (10YR 4/1), no wood debris, trace of fine light brown , abundant tan silt nodules up to 1/2" dia., no sheen, slight
ARK-WB-39-6-8	1655	75	3.9	NS	6			As above with color ver trace of sand.	y dark gray (10YR 3/1), no clay, no odor, no tan silt nodules,
		(6-8)	**********	*******				Piece of 1/16" thick x 4"	long plastic at 7.0 ft bml.
	**********	***********		******			200	Piece of asphalt ~2-1/2	
ARK-WB-39-8-10	0900	60 (8–10)	8.2	NS	8			As above with weak che	emical odor, trace of angular gravel up to 1/2" dia.
ARK-WB-39-8-18	1150	(8–18 ft	comp	L osite)			:	Two pieces of concrete	
*********************************	48888868666				10	ELLER ESTATE		Piece of concrete ~2" d	
ARK-WB-39-10-12	0915	100 (10–12)	824.4	NS.			L	brown (10YR 4/2), som	el, strong chemical and decaying vegetation odor, dark grayist e orange mottling, trace of fibrous organic material, 10% clay
***************************************		*************	********					As above with no clay.	very dark gray (10YR 3/1).
ARK-WB-39-12-14	0935	100	142.3	NS	12				ely strong chemical and decaying vegetation odor, 2% wood
********************************		(12–14		ļ					orange mouning. od debris below 13.5 ft bml.
**************************************	L	L	1	1		Market Police	/		black (10YR 2/1), trace of wood debris, very light spotty
Sneer ARK-WB-39-14-16		rved 14-	14.0	*******	14	* * *	SF	sheen, slight petroleum	· · · · · · · · · · · · · · · · · · ·
Marketter of the community of the commun	1	(14–16					MI	See page 2 for descrip	tion.
Drilling Contract Drilling Method Start Time End Time		Accession and access		Roto 1520	-son) 28 -	igyea ic Sep-0 Sep-0	19		Sampling Equipment/Notes 4" dia. x 5 ft long split spoon (0–25.7 ft bml); 4-7/8" dia. x 5 ft long solid core barrel (25.7-26.1 ft bml). Ran 6" dia. casing beginning at 6 ft bml. Barge was pivoted ~1 ft north when the borehole was sampled to 6 ft bml. There was a large rock on the sediment surface that deflected the split spoon sampler and would not allow the casing to be run through the moonpool.

	K	Scansul	ting ti	1 C.				BORING NUMBER WB-39 PROJECT Arkema EE/CA LOCATION Portland, Oregon PROJECT NUMBER C167.1103 LOGGED BY Eron J. Dodak, R.G. Page 2 of 2						
	APLE	NFORMATIC	***************************************											
Sample Number Time Recovery PID (ppm) Sheen								ASTM SEDIMENT DESCRIPTION						
		************	*******				ML	SILT: very dark gray (10YR 3/1), coarse, micaceous, no sheen, slight petroleum odor.						
******************************		********************	*********		16		SM	Silty fine SAND: very dark gray (10YR 3/1), 30% silt, micaceous, slight chemical odor, no she	en.					
ARK-WB-39-16-18	1030	35 (16–18)	24.9	NS.			SP	Fine SAND: very dark gray (10YR 3/1), 5% silt, no sheen, slight chemical odor.						
**************************************		**********************	*********	*********										
ARK-WB-39-18-21	1045	100	14.0	LS*	:18-			As above with fine to medium sand, black (10YR 2/1), no silt, trace of red sand grains, trace wood debris 1" to 5" long, no sheen, slight chemical odor.	ace of					
***************************************		(18–21)	********	**********		L+ * *		WOOD GESTER TO COME, TO STEEDING STREET COME COME						
*Sheen	20.2-2 1	1.0 ft bml.	*******					Silt lamination 18.55-18.60 ft bml.						
	*********	*********************	*********		20			Silt lamination 20.2-20.4 ft bml, gray (10YR 5/1), micaceous, weak chemical odor, very light spotty sheen.						
ARK-WB-39-21-24	1100	100	18.1	LS*				At 20.4 ft as above with no wood debris, weak chemical odor.						
	***********	(21–24)	*******		22			At 21 ft bml, as above with no sheen, slight chemical odor.						
*Sheen obse		2.9-23.4 ft bri	1.					Silt laminations ~0.05 ft thick at 21.3, 21.5, 21.7 ft.						
************************************								Sitt lamination with wood debris, 22.45 to 22.65, gray (10YR 5/1).						
********************************	***********	*********************	********	******				Silt lamination 22.9 to 23.0 ft with wood debris, light sheen, weak chemical odor. As above, very light spotty sheen, slight chemical odor.						
ADZ MO 20 24 25 7	4490	400	0.0	NS	24-		ML	SILT: dark gray (10YR 4/1), coarse, micaceous, some orange mottling,	2 100029992500000					
ARK-WB-39-24-25.7	1130	100 (24–25.7)	8.9	11/1/2				no odor, no sheen.						
240124000000000000000000000000000000000	**********	************************	*********	l				As above with color dark grayish brown (10YR 4/2), no odor, no sheen.						
**************************************		************************	1		26-		R	BASALT: black, slightly vesicular (1/16 to 1/8" dia.), well indurated, no sheen, no odor.						
	1140	A real research and a second control of		NS	-	-		Borehole terminated at 26.1 ft bml.	HOMEO CONTRACTOR OF THE PARTY O					
**************************		(25.7–26.1)												
*******************		********************	********											
********************************		*****************		.	28-	-								
***************************************	ļ	***************		······	1									
***************************************		******************	*******	********										
4.2.4.4.2.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4	1	*****************	********											
group, PEEN _ AND, A						an anisi sine -		Sampling Equipment/Notes 4" dia. x 5 ft long split spoon (0–25.7 ft bml); 4-7/8" dia. x 5	ft long					
Drilling Contractor Drilling Method					rt Lo >-sor	ngyea iic	ul .	solid core barrel (25.7-26.1 ft bml).						
Start Time				152	28	Sep-0	Barge was pivoted ~1 ft north when the borehole was sampled to ft bml. There was a large rock on the sediment surface that							
End Time				120	29-	Sep-(
-				- paramotenio		de and the feet of		deflected the split spoon sampler and would not allow the objection be run through the moonpool.	asing t					
k														

integral sconsulting inc.							BORING NUMBER PROJECT LOCATION PROJECT NUMBER LOGGED BY	WB-42 Arkema EE/CA Portland, Oregon C167.1103 Eron J. Dodak, R.G. Page 1 of 2				
SAM	PLE II	VFORM/	MOITA	,								
Sample Number Time Recovery (ppm) Sheen Symbol						•		ASTM SEDIMENT DESCRIPTION				
ARK-WB-42-0-2	0920	50	3.3	NS		GW	Sandy GRAVEL: dark brow	n (7.5YR 3/2), 30-40% fine to medium sand, fine to 3" diameter				
***************************************	**********	(0-4)					angular to subrounded grav	vel, no odor, no sheen, 5% silt.				
***************************************		******************										
		*************			2							
ARK-WB-42-2-4	0930	Notes:	1.9	NS		sw	Gravelly fine to medium SA gravel, trace of red brick de	ND: black (10YR 2/1), 15-20% 3/4" to 1" diameter subrounded sbris, slight chemical odor, no sheen.				
***************************************	***********	*************		********			Sandy SILT; very dark gray of clear glass, slight chemic	rish brown (10YR 3/2), micaceous, 15% fine to medium sand, trace cal odor, no sheen,				
ARK-WB-42-4-6	0945	40	27.3	LS	4-		As above with 15% fine to	1.5" diameter angular gravel, trace of fibrous organic material, very				
***************************************		(4-6)					light spotty sheen (1-2 spot	s), moderately strong chemical odor.				
ARK-WB-42-0-6	1215	(0-6 ft	compos	site)								
					6-		Piece of copper wire ~4" lo	ng.				
ARK-WB-42-6-8	1045	100	66.2	LS				wn (10YR 3/2), soft, <5% angular gravel up to 1.5" long, very light				
	********	(6-8)	>x4+tt+++4+11	*********			spotty sheen, strong chemi	cal odor.				
	***********		*******	********								
	********	**********	*****	******	8	= -						
ARK-WB-42-8-10	1112	100	240.3	NS			As above with no gravel, so	ome black mottling 8 to 8.2 ft bml, strong chemical odor.				
***********************************	*********	(8-10)										
ARK-WB-42-6-14	1450	(6-14 ft	compo	site)			A 1					
	**********			2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	10		As above with 30% fine sa					
ARK-WB-42-10-12	1130	************	66.7	LS		3	As above with no sano, ve	ry light spotty sheen, strong chemical odor.				
*******************************	**********	(10-12)	**********	*********		j						
**********************************	***********	**************	**********			SP SP	Fine to medium SAND: bla sheen, strong chemical od	ck (10YR 2/1), trace of coarse sand, possible very light spotty or.				
			050	NS	12-	₹WL	SILT (as above)					
ARK-WB-42-12-14	1150		35.9	NS		SP	· I	ack (10YR 2/1), trace of red sand grains, no sheen, weak chemical				
**********************		(12-14)	**********	!		Jor	odor. Piece of wood debris ~2" le	ong at 12.5 ft bml.				
		l					Piece of wood debris ~1" h					
ARK-WB-42-14-17	1313	75	9.1	NS	14		As above with slight chem					
MNV-440-47-14-11	1010	(14-17)		I								
Drilling Contract Drilling Method Start Time End Time				Roto 0838	t Longye -sonic 25-Sep-0 25-Sep-0	9		Sampling Equipment/Notes Ran 6" dia. casing beginning at 4 ft bml. 4" dia. x 5 ft long split spoon (0-26 ft bml); 4-7/8" dia. x 5 ft long solid core barrel (26-27 ft bml).				

	te	Scott	3 I	N.				BORING NUMBER PROJECT LOCATION PROJECT NUMBER LOGGED BY	WB-42 Arkema EE/CA Portland, Oregon C167.1103 Eron J. Dodak, R.G. Page 2 of 2				
SAM	PLE	NFORM	ATION	ı									
Sample	© 50 50 80 80 80 80 80	% Recovery	Old (mdd)	Sheen		Graup Symbol	Number of the State of the Sta		ASTM SEDIMENT DESCRIPTION				
	**********		**********	*********	16-		SP	As above.	5				
ARK-WB-42-17-20	1325	80 (17-20)	4.3	NS	18		ML	SILT: dark grayish brown	n (10YR 4/2), micaceous, coarse, no sheen, no odor.				
ARK-WB-42-20-23	1345	80 (20-23)	3.4	NS	20-	Experience of the control of the con		As above with 15% clay,	fine silt, stiff, no sheen, no odor (clayey SILT).				
********************************	**********	************	**********	*********	22			As above.					
ARK-WB-42-23-26	1420	100	0.7	NS				I	ay (10YR 3/1), micaceous, no sheen, no odor.				
	***********	****************	**************************************	**********	24-		IVIL	SILT: dark grayish brown	n (10YR 4/2), micaceous, coarse, no sheen, no odor.				
endernegresia en	1425	(26-27)	**************************************	NS	26-		Rx		ous vesicular texture to vesicular (1/16" to 1/8" diameter sicles), moderately well indurated, no sheen, no odor.				
***************************************			********		28-	-		Borehole terminated at 2	27 ft bgs.				
	*********	***************************************	********	***********									
Drilling Contrac Drilling Method Start Time End Time	tor			Roto 0838	-son 25-s	ngyea ic sep-09 sep-09			Sampling Equipment/Notes Ran 6" dia. casing beginning at 4 ft bml. 4" dia. x 5 ft long split spoon (0-26 ft bml); 4-7/8" dia. x 5 ft long solid core barrel (26-27 ft bml).				



PROJECT: Portland Harbor RI/FS

Core ID: <u>LW2-C348</u> pg <u>/</u>of <u>/</u>

Collected:			
Date: 1/ /8 /04	Drive Length:	11 1 cm	
Time: 649	Tide Level (CRD):		
Recovery Length: 144	(2-2√Nudline Depth:	2466 13	-5
Recovery Efficiency: 08		R.V. Nancy Anne	(MSS)
Crew: <u>D& bD</u>	T TH		

Depth in	<u> </u>	G	Grain	1 Size		FID	
Core	Lithologic Description:			%)		PID	
(cm)	(Grainsize, color, density/consistency, odor, organics, debris)	G	S	Si/CI	Photo ID	(ppm)	Sample ID
039	SILT, good for live-ned son		65	.85	****	m /	442-6348-1
· · / ** · · · , a · · · · · ·	Sord Sustanded, trave well tray	* 4.9				Z. 4.7	
	small, trave rootlets, net.		sa se s	n in days at a n	i an e se i i i il in e e e e e e	w constant	4echive
	all And Lugar			- i - 2 km m'r	જ અને જાજ કે જિલ્લામાં કે	e exist	e e especiel es la reconstrucción de la composición de la composición de la composición de la composición de l
	NO Par lotted go locating		34.60,30	i gun abana		*****	西部公公文。 人名巴西西西西亚加西葡萄南亚
20-	SUT, gray, true liegger send.		75	75	rawara'anawa'i awaa	1. U. U. U. U. U.	4-2-03-8
753	trace plant retorn - leat litter to	Magazine in in	146-30-	era bi eser i a		366	
	60 cm. Leases of some fie gran	- 4 4		of many contract of the state			1 Additional
*****	said and Few plant restered @	8.0.4	V 34 (4)	- * # * * * * # * # *		we reco	有一個小學術學學 化甲基磺胺苯基磺胺 化二二烷二
	65-66 cm, 72-72cm, 108-122cm	***	v 8,45		. t ou a . o jera č deje	4 4 4 4 .	i i i wakazi i wa wa wa
50 × 50 × 60 × 60 × 60 × 60 × 60 × 60 ×	trae wood frags. v. moist.		11.85.4	e redictions		en i car	ं के क्रों कर संस्था के स्था के के क्षा की रूप र
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· · · · · · · · · · · · · · · · · · ·	176en, 209-211cm, 229-230cm.			om mar serval. S	- S - 1 THE BUILDING BUILDING BUILDING	4	a care e e e e e e e e e e e e e e e e e e
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*,*********	SUGET TEH OSSELSTAWEST WITH STAWES		i e	normal e	વ્યવસ્થાન દેવા ઉપયોગ	180 08	e a magaza a se dan e gar
Section to be as where the sec	carees 100's reconny					- h N-	
7/25-	ca or Production		70	2.	· • · · · · · · · · · · · · · · · · · ·		6-32-63-8-0
V.G	sans fac to red grand sub-	\/.	70	. D.,	en gold de en benom d'	/16 i	Remarkable Comment of the Comment of
	60000, 295-369 en (gradational)						ANALLES
	st leses @ 262 - 266 cm, 299 -	- 20 d d √ ap				- or - rokser	The second se
	304cm. Some wood frays 240-			u.			
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Composition and a file	SUGHT TPH DOOR SHEEN 240-264cm	- n v'a			. આ મામ જ જેમ આ પોલિસ્ટ્ર	181 W	v 1999.00
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er en seguel de en se de de de se se	and the state of t	* * * *	*	haanin aan a		** - ** *	নিহাছিত ভাজনালভাগতি হয়। কাহাজনিকজাল গড়ডুজানান
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	AMMZE ALL DUE TO SFE FS MUSIMUM					****	· "我们就要说,这一种,我们们,我们就是我们的。" ————————————————————————————————————
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Corona	mont brooks at (am): 0		ليا			,	
Core seg	ment breaks at (cm): 0 - 109 / 109 - 218 /21	8 -	-7	16/5	325-31	69	



PROJECT: Portland Harbor RI/FS Core ID: LW2-C 357 pg / of /

Collected:	Processed:
Date: 11/8 104 Drive Length: 18	Date: <u>U/9</u> /04
Time: 1503 Tide Level (CRD):	Time: <u>/400</u>
Recovery Length: 14 Mudline Depth: 24.8	Core Length: (3 ' / '
Recovery Efficiency: 93 Vessel: R.V. Nancy Anne (MSS)	Location: Core LAB
Crew: D& DO BJ JH	Crew: MT JM SF

Depth in	Lithologic Description:	G		Size		FID	1 1
Core (cm)	(Grainsize, color, density/consistency, odor, organics, debris)	G	(º) S		Photo ID	(ppm)	1
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	granded rounded wet.				400000000000000000000000000000000000000	12200	
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ope oneware	notting fraction - stand 27-	: h -a,		********	· A PROPERTY - AND	'	ଦ କ୍ରିବର୍ଷ ବର୍ଷ ବର୍ଷ ଅଟେ
	8-30cm sect, gray is light gray mothing, trave fixe grain and notice of staining - black 27 - 30cm with advocaded TPH some +		a n ka				化奎基酚甲基二甲酚甲基酚甲基甲甲基酚酚 ()
******	STACON ACT		* * * :	******	i operations and	*****	· · · · · · · · · · · · · · · · · · ·
	SLIGHT TRH. + METALLIC ORDE, SHEEN	es y de la		*****	· www.ese.co.co.co.co.co.co.co.co.co.co.co.co.co.	****	-8 ആക്കുന്നിക്കുന്നു (എന്നിയുന്നു ക്രണം ക്രണം)
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	@ 51-80cm ind.		~ *	4 44 4 2 4 4		2690	1 ANALYEE
			7				
1 5 5 4	SLIGHT. THE ODOR SHEEN IN YOUR FRAGE	ð.		*** ***	was improved an ex-		i de de espantación de se
continue in its and the	D. G. Cellang	*	v 4 s.		Lander beare	na - ajes	
80.	SAND fine to med grain, granz	0	95		the second second	-/	42-0356-6
2.2	moderately sarted, subcompled,				eretween to a server ere.	197	ANACA ZE
	3AND fire to med grain grang moderately sarted subcombed trave sat roust isolated seam sat module @ 150 cm	, er - s	8.	876 T \$4.8			and a de
	െട്ടിയ്ക്ക് ക്യൂന്നത് പ്രത്ത് നോഗ് ത്രിയ്ക്കാനെ വിഷ്ട്ര്യ്യാ ഒന്നത്ത് ത്രിയ്ക്കാന് വിഷ്ടര് കൈകായ ക്രയം വഴയുടെ വ ഇത്ത്രത്ത് പ്രത്യത്ത് പ്രത്യത്ത് പ്രത്യത്ത്ത് പ്രത്യത്ത്ത് വിഷ്ടര് പ്രത്യത്ത്ത് വേശ്യത്ത്ത്ത്ത്ത്ത്ത്ത്ത്ത്ത്ത ഇത്ത്ത്ത്ത്ത്ത	: 0 m m			**************************************	e annima e e e e e e e e e e e e e e e e e e e	
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1. 43, 47 (4. 18 48 46 4 5 4 5 4 5	cosil record			****		15.7	. A second of the second
2/2-	SAND AS ADDUE translin from	0	95	5			4612-6351-0
325	Grang to Brown/gray through DESTERNAL, ISSUETES SUT NOSSUE	· · · · · · · · · · · · · · · · · · ·	si de se	电解用心造电台	The section was to be a con-	1.507.	AJALAZE
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356-	SAND TO SIFT, 335-362 8AND, U.	ð.	65	35			LL/2-035/-E
359	the sin, few sit, gray brown,			* * * * * * * *		13/00	100
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	8387-3950m, mout		and and	****			
	NO DORLISHREN los la recens	5 # 10° #					
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PROJECT: Portland Harbor RI/FS

Core ID: LW2-C3602 pg 1 of 1

Collected:	Processed:
Date: 10/26/05 Drive Length: 19	Date: <u>/0/27/05</u>
Time: /459 Tide Level (CRD):	Time: <u>0915</u>
Recovery Length: 17.1' Mudline Depth: 14.6'	Core Length: 501
Recovery Efficiency: うかん Vessel: R.V. Nancy Anne (MSS)	Location: FIELD LAS
Crew: DS NO BJ JH	Crew: NV SF JS AR MT RW

Depth in		G		Size		FID/	
Core	Lithologic Description:		(%			PID	
(cm)	(Grainsize, color, density/consistency, odor, organics, debris)	G	S	Si/CI	Photo ID	(ppm)	Sample ID
0-30	5. 31 x / 5000 : 5000 . 3 v / 602	6+2544329	įψ	20		31/	4412 C340:A2
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		e Charle	235 (SA)	***********		e de la company	the test of the times of the section
30	SULTHISAND SALA IS U.L.NE. 30()		15	.(4.)A	*********************	7.3/	MU 2-0360-82
20	5. 4 HOSANO SAND IS U.F. NO. 3017 med grayist brown of black stand bond of Salfac aloc to could to	4349945	11.000	aalikkipuu va aasiliitikk		Zie.	
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.!/\):	5.14 ml samo, 5.14 ml 3/m (83160%)		25	75		394	442-6340-82
30/	whatever five sames in laminar lowers					120	
. 2024-08287-08-48-68-48-68	1 Min back & Clean) 5 cm Jac to					(1000) (100) (100)	and the second second second
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a o choirí o a a se e a cheann a ch	Jelacus Iplant delecis, Stucks), a blacker for	A	14-3		a a contrata de la constitución de	1	
	TOARD BLUCK STAND IN LAMINAR	+		e en electronisti des	a salah katan katan merupakan	45/ /21*	
ranjana z propinska zavelska bil	302cm IV Small show Clurchs (Elma)		r dinging	i elementario en la companio en la c	· · · · · · · · · · · · · · · · · · ·	1621	
elege activity of the continuous of the	Made Streams CHEMICAL DODGE	<u>.</u>		i erneriseaken	(f = Talkerbygovskippaeneskija	stranionsky)	
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	agarilo da idazassa, marronalmunia, maagari mamin aharran ingenereken papun nebenereku manyun megapanan ida sherahur kendan m	e de de la compansión de			.,	19/	
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	and kanadan kanada kendendi kundan dan dinada kendengan kendengan kendengan bebangan pendengan bebana bebana b	1.47.84	1 (4.64.9)		ga de Tales (โลโลโลโลโลโลโลโลโลโลโลโลโลโลโลโลโลโลโล	147	T
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*******		0.5, 4 9.4	**	in carsingstoning	*** 281-254-401-40-00-00-00-0	Richard and majory	
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	and the second s			ere reresentit	*******************	nak li kaya ya ka i	
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	gment breaks at (cm): (^)-110 ; 110 - 244; 214 - 31	_	23.6	24986	1.76- Euc		

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SEDIMENT CORE LOG

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PROJECT: Portland Harbor RI/FS

Core ID: __LW2-C 366_pg __C of ____

Collected:	P
Date: 1/9/04 Drive Length: 19	
Time: 0934 Tide Level (CRD):	
Recovery Length: /3 - 2 Mudline Depth: /3 - 4-	
Recovery Efficiency: 7. Vessel: R.V. Nancy Anne (MSS)	
Crew: DB DD BJ JH	
VIV. 172 43 134 3.11	

 rocessed:

 Date: // 9 /04

 Time: /600

 Core Length: 395

 Location: Coxe Lab

 Crew: MT JM SF KPT0

Depth in	(14)	Grain Size			FID		
Core (cm)	Lithologic Description: (Grainsize, color, density/consistency, odor, organics, debris)	0	(°)	6) Si/Cl	Photo ID	PID; (ppm)	1 1
9-30	SILT, Brown 5 rel the start	ţ	-	80	I HOLO ID	NAN	442-C366-12
S 94 6	few med grin sand 0-10 cm (time			- V	ara sa manana mpak	/103	
rain was na na	Sand blust grit), 22-28 cm,		e de ju	Control of the second	and the second s	1-3-8-148-4	ARCHUE
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52-	SILT Brown is red the -staining few fire - med oring send counseld trace plant frags + wood frags	φ.	15.	85	a asanisasi	NA.	442-5266-82
(00	ten the med or send coulded.	# 27 . W	1 14-45-40 1	s at tack a second at	orana kaka sa ara ara ara ara ara ara ara ara ara	Z\$12.	ra - researcanas e
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1.99.5	trave hie grin sul some med	0.	4	80	e duse a calesce	NY.	442-006-C2
and a Subol of the a	5m sol @ 101-103, 110-111,	v 0 14 4	446	ord karad	ြင့်သက်အလက် ရောင်းရေးသည်။	196.	ANACIZE
人名马格尔 化酸氢甲酚磺酸	127-132, 142-145, 169-172,	e e e e e e e e e e e e e e e e e e e	e e le'i		tenggerengen	F-4648	
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	operation of the contraction of						
288 -	SAND, med gran, sudangelor, drown	15	65	20	· ='a · · · à · · · · à · · · · · · · · · ·	N/	42-0366-62
34.8.	FEW SAC, FEW COBSES (TUP TOUP) E	2 K-m 4	races a c		tau inikan anan	1214.	
	220-339em, + SILT NOWES CYCM. SHODENATE PESTILIDE DOOR COOL NEWS		, yi 2 ay 1	有明白小女明之.明	"好快赛这么好。""我我有事情		45-04-14.C.
348 -	SILT, LIGHT BROWN TO TELLOW, Par Sand	13	80	15	o makai Perdimenden	NA	Lu2-0366-FO
388	fine-med scin Q 360-376cm, issiated	had a				758	
	408061 @ 751 on + 3766m	, we can de		医特温含水水液素		******	.A. J. Alen &
Core sea	moderate park Pericof 100/ 1004 ment breaks at (cm): 0-112 /112 -720 /240			- fn	2 7 - 39	· ·	
void ach	mone broads at july. 0-116/116-120 1000	14.00° .	2	r 13	4 - > 9	<u>ب </u>	

Attachment C ERM 2005 Upland RI Report Figure 8 – 3D Views of Shallow Zone DNAPL

